AMIGA WORLD

September/
October 1987
U.S.A. $3.95
Canada $4.50
UK £2.50
A CWC/I
Publication

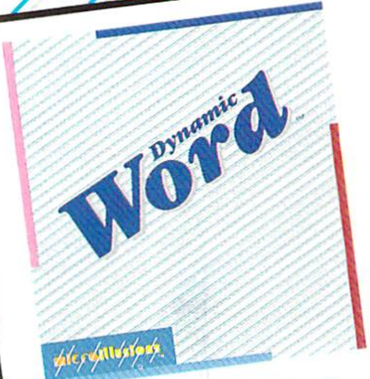


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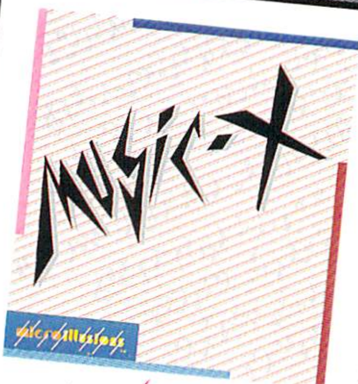
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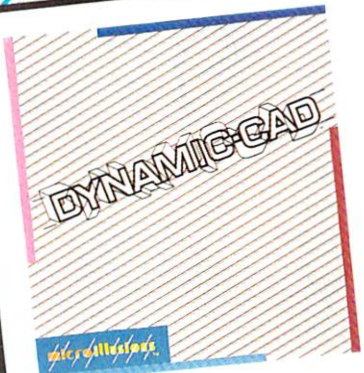

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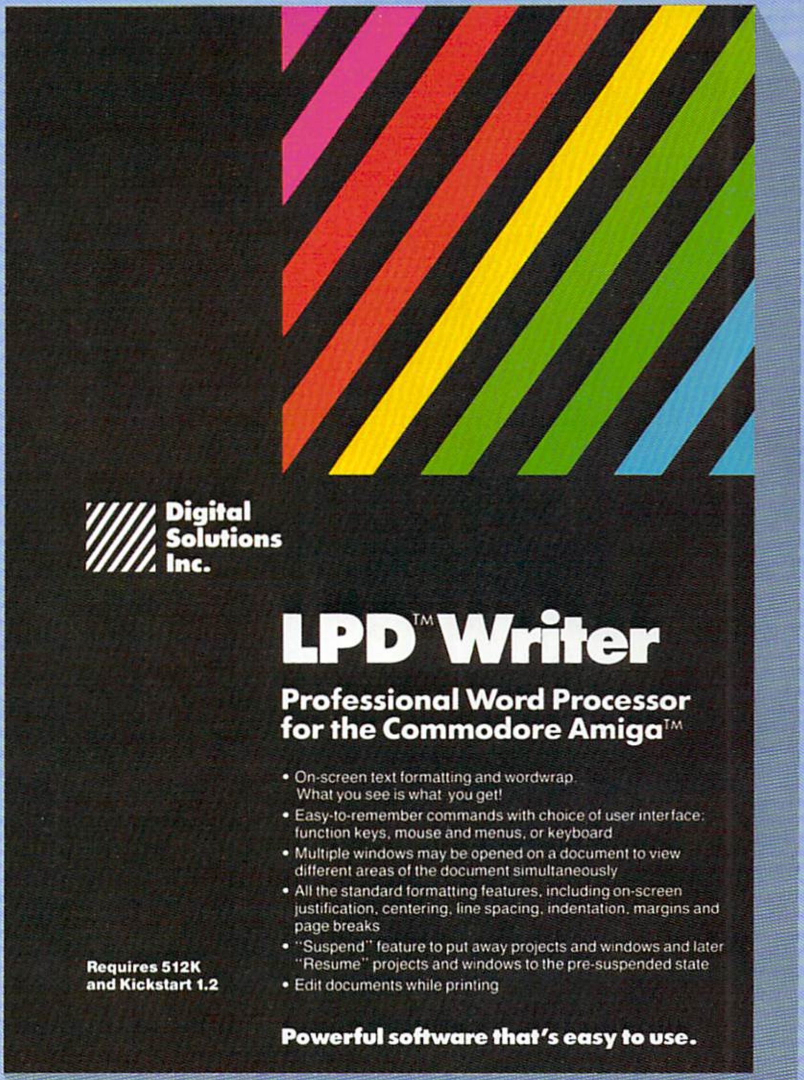
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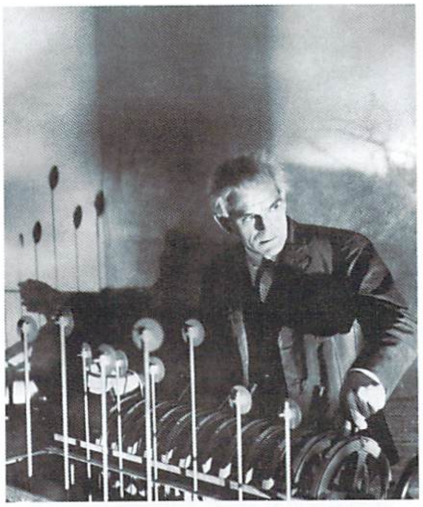
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SEPTEMBER/OCTOBER 1987

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AmigaWorld (ISSN 0883-2390) is an independent journal not connected with Commodore Business Machines, Inc. *AmigaWorld* is published bimonthly by CW Communications/Peterborough, Inc., 80 Elm Street, Peterborough, NH 03458. U.S. subscription rate is $24.97, one year; Canada $47.97 (Canadian funds), one year only; Mexico $29.97 (U.S. funds drawn on U.S. bank), one year only; Foreign $44.97 (U.S. funds drawn on U.S. Bank), one year only, foreign Airmail $79.97 (U.S. funds drawn on U.S. bank). Second class postage paid at Peterborough, NH, and at additional mailing offices. Phone: 603-924-9471. POSTMASTER: Send address changes to *AmigaWorld*, Subscription Services, PO Box 868, Farmingdale, NY 11735. Nationally distributed by International Circulation Distributors. *AmigaWorld* makes every effort to assure the accuracy of articles, listing and circuits published in the magazine. *AmigaWorld* assumes no responsibility for damages due to errors or omissions.

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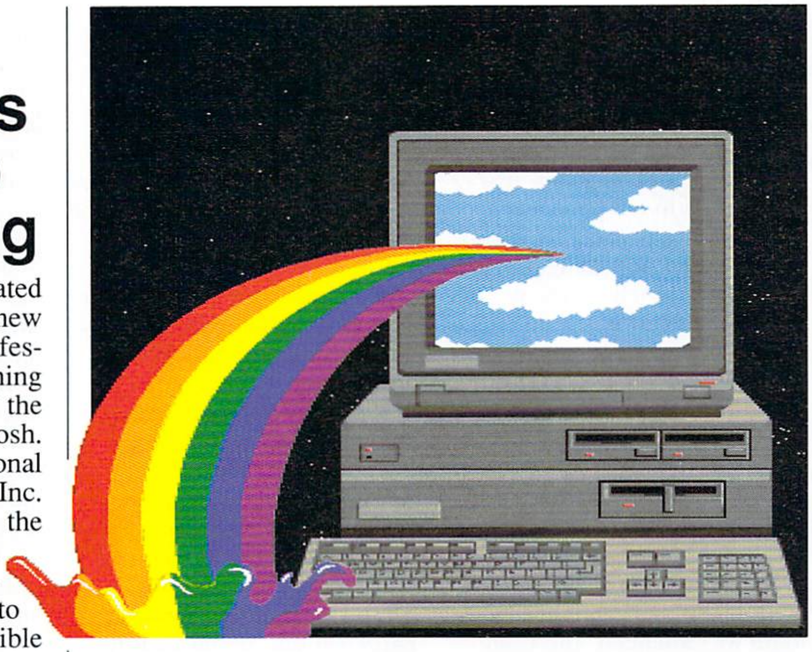
New Laser Times

VOL. CXXVII No. 2

MAC ATTACKED

Amiga Redefines Desktop Publishing

This page was created with revolutionary new software that pushes professional desktop publishing far beyond the reach of the black and white Macintosh. Introducing Professional Page from Gold Disk Inc. Priced at US$395, it's the first product to channel the Amiga's incredible graphics capabilities into a PostScript compatible desktop publishing program for the serious power user.



SPLASH ON THE COLOR. Even create magazine quality color documents.

Graphics make the difference

The world isn't as simple as black and white. So Professional Page converts graphics to black and white half-tones that appear on the screen in 16 shades of grey. Try that on a Mac SE.

And with Professional Page's optional color separation module, priced at $195, you can make quality color separations of Amiga graphics containing up to 4096 colors. Import IFF bit-mapped graphics, structured graphics (Aegis Draw Plus) -- even HAM files.

And not only does Professional Page support all PostScript compatible laser printers, but it can also create magazine-quality output at up to 2400 dpi when interfaced with a Linotronic typesetter (just like the page you're reading now).

Professional Page Design

Professional Page uses a powerful, yet easy to learn user interface to control all facets of layout. Page elements are moved around the screen with the simplicity of point-and-click, two-button mouse control. Page sizing, repositioning and rotation is effortless.

A fully integrated word processor and graphics editor provide instant access to powerful on-screen tools. Professional typesetting features include auto hyphenation, kerning (auto and manual), leading and tracking. You can create typeset quality text with any combination of 16 different PostScript fonts - with more on the way. Italics, bold text, underlining, outlining, and shadowed faces give the user a wide range of styles and expressions.

Stretch or shrink your text with point sizes ranging from 127 to 1. Or stretch your page to as large as 17x17 - even bigger than a tabloid size newspaper.

To find out more about the Amiga's answer to the Macintosh, call the company that just created a new Gold standard in desktop publishing. Gold Disk Inc, PO Box 789, Streetsville, Mississauga, Ont, Canada, L5M 2C2, (416)828-0913.

THE GOLD DISK SOFTWARE FAMILY

A Gold Mine for Amiga Owners

Besides the revolutionary Professional Page software for the power user of desktop publishing, Gold Disk Inc also offers easy-to-use entry level desktop publishing (PageSetter 1.0, $149.95), with modules that add exciting new typefaces (FontSet 1, $34.95), PostScript laser printer typesetting capabilities (PageSetter LaserScript, $44.95), and Hewlett Packard LaserJet printer interface (PageSetter Jet, $44.95).

In addition, Gold Disk also features a spell checking program, GoldSpell 2, with a 90,000 word dictionary. It not only suggests correct spelling, but also allows you to create a private dictionary of personal terms for use with your word processing software.

GoldSpell 2 works with most popular wordprocessors including TextCraft Plus, Scribble!, ProWrite and VizaWrite.

MacAnon Just Say No

MacIntosh Anonymous Meeting. There's no reason to be ashamed, millions of people have made the same mistake. The people at MacAnon specialize in Amiga desktop therapy

HISTORY IN YOUR HANDS

Zeitgeist

A drum roll and fanfare please.

AmigaWorld *is going monthly!*

By Guy Wright

THAT DESERVES repetition. *AmigaWorld* is going monthly starting with the November issue! That's right folks, we finally managed to convince the gods of publishing that it was time to step up the pace by a factor of two. With every letter and phone call, you've been asking when we're going monthly, and we have been asking at every meeting and in every memo when we're going monthly, and now we are. There is just too much going on, too much ground to cover, too many machines out there, too many new products to review, to try to cram everything into issues that come out only every other month. Now we will be able to give you twice as much information twice as often. Of course that means that we will have to be working twice as hard, but everyone here is more than ready.

By the time you read this, the new Amiga 500 and 2000 should be shipping, and we expect wonderful things from both additions to the Amiga line. If nothing else, there will be more Amiga owners out there and that means more companies will be developing new software and peripherals as the Amiga market grows. It is impossible to tell how or if Commodore is going to be promoting their new Amigas (it is impossible to tell anything about Commodore), but the machines themselves ought to attract new buyers and developers.

At the Comdex show this spring, Commodore made a big splash with both machines, and it was nice to see them back at the show. There was a great deal of excitement around their booth. Their press conference and developers conference were both well attended, and Commodore talked about positioning of the 500 and 2000 (the 500 is the "ultimate home computer" and the 2000 will be the custom application machine for people doing CAD, CAE, video, desktop publishing, etc.). They talked about advertising in television and in print again, which is a good sign. Their finances seem to be in order. Now with Duncan and McIntyre, their new President and General Sales Manager, respectively, beginning to get the feel of things, I think that Commodore may be finally on the move again and out of that retrenching and holding mode they adopted for the past year. Overall, the show was encouraging. Now if Commodore just delivers on this newest set of promises, everything ought to be great.



The AmigaWorld editorial staff inspects the new Amiga 2000. Back, left to right: Bob Ryan, Shawn Laflamme, Linda Barrett, Vinoy Laughner. Front: Guy Wright.

On to other things.

The newsletters are great, keep them coming. The *AmigaWorld* Public Domain Library is getting under way, but we still need more "audience participation." If you want to send donations of programs, we have lots of room on our shelves, and your name will go down in history, and we could use the programs, and it would be one small step for man, etc. . . . If you don't have any public domain software that you would like to share, then by the time you finish with the articles in this issue, you will be able to start writing your own. As it says on the cover, this issue is about programming the Amiga. Even if you never intend to do any programming at all, it might be worth it to skim over the articles just to get an idea about the languages, ideas and interests of programmers. Sooner or later you are going to run into someone, at work or at a party or somewhere, who is going to try to impress you with his computer programming acumen. That's when you can dredge your memory for a few choice programming terms and a concept or two. When everyone is suitably amazed by your hidden knowledge, you can shrug it off and say something like "Oh, I don't do too much programming these days, I just like to keep up." And everyone will think that you are just being modest.

If you don't buy that, then there are always the reviews and Hors d'oeuvres. (By the way, keep sending in those tips; the first run of official *AmigaWorld* T-shirts is dwindling fast. When they're gone, we will probably switch to something else and the shirts will be real collector's items.)

If you ARE into programming, then why are you reading this? Did you already finish the rest of the magazine? Don't tell me that you actually care about the things I say? I know, you like to tease yourself by reading some of the junk stuff before savoring the good stuff. Well, I know when I'm just being used. Go ahead, turn the page . . . I haven't got anything more to say anyway. So there.

Oops, I almost forgot. This is the last issue that Vinoy Laughner will be working with us. He is going back to grad school this fall. He started working with *AmigaWorld* back in the dark ages and has been responsible for a lot of what made the magazine great. We wish him lots of luck and a couple of years worth of thanks. ■

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Win A Thousand Dollars!

Here's your chance to win big and show off your Amiga talents! Aegis Development is sponsoring a Desktop Video contest and you could win as much as $1000.

Any video of five minutes or less and produced on ½″ (VHS or Beta) or 8mm tape using an Amiga and one or more Aegis products is eligible. Each submission will be judged on animation, special effects, computer and software use, artwork, creativity, editing, story line, sound, and directing.

To help you win, we've put together a great line of Desktop Video products such as:

Aegis VideoScape 3D Which produces animation in three dimensions. It handles hidden surface removal, light source shading, and perspective. You specify movement for the objects and camera and then it generates the scene, frame by frame for recording. It supports IFF pictures for foregrounds and backgrounds, works in all resolutions, uses overscan, and best of all, it's fast. And that's only the beginning.

Aegis Animator Our classic two-dimensional animation system which supports cel, metamorphic, and color cycling animation.

VideoTitler Gives you the power of a professional titling workstation at a fraction of the cost. It has polygon fonts for distortion and special effects, and supports all of the Amiga fonts. It has 11 text styles such as "Fat Neon," "Balloon" and "Emboss." There are 5 different effects, like drop shadow in 8 directions or color gradation, and many more features.

Sonix For sound and musical effects we have an instrument synthesizer and music composition tool. It supports IFF scores and instruments and MIDI output.

AudioMaster One of our latest releases that makes Sonix even more powerful. It's a digital sampling and editing system that gives you sophisticated editing control over a sound's waveform. Many special effects are included such as "Echo" and "Backward Masking."

To enter the Desktop Video contest, just stop by your local dealer and ask for an entry form. Each submission (you can enter more than one) must be accompanied by a separate, signed entry form, and received no later than October 15th, 1987. Employees and family members of Aegis Development Inc., Commodore Computer Inc., Commodore International, and contest judges are ineligible.

AEGIS DEVELOPMENT

2210 Wilshire Blvd., #277
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Repartee

Sheldon's Rebuttal

Contrary to Mr. Taylor's [Vice-President, Meridian Software] suggestion, I did not form my opinion of Zing! on the basis of a brief examination. [See Sheldon Leemon's review of Zing! in May/June '87, p.70, and Mr. Taylor's response in July/August '87, p. 8.] Mr. Taylor personally gave me a thorough demonstration of Zing!'s features at the Amiga Developer's Conference. When I received a copy of Zing!, I read the manual carefully and tried all of the program's features over the course of several operating sessions. Almost every disk that I own has a ".Zing!" file in each directory.

Mr. Taylor and I agree that Zing! has an enormous number of features, far more than I could possibly cover in my review. The specific features of Zing! that I discussed were those that I thought represented the program's overall performance. In my view, a program's usefulness doesn't necessarily correspond to the number of functions that it can perform. Often, simplicity is more helpful than an overwhelming array of options.

Mr. Taylor feels that each of Zing!'s features is unique and invaluable. I simply don't agree. I have used several programs which, separately, perform each of the basic functions provided by Zing!. Nor do I see any particular advantage in combining all of these utilities into a single program. On a multitasking machine like the Amiga, utilities compete for memory space with other applications, as well as for disk space. In such an environment, it may be more efficient to have many small, single-purpose utilities, rather than one large, multipurpose one. Such an arrangement allows the user to devote space to, and pay for, only the functions he actually needs.

Sheldon Leemon
Huntington Woods, MI

Homesick

We here in Westchester County (New York) are still trying to get over the Jets' and Giants' move to New Jersey. Therefore, we became a bit upset when we found ourselves moved to Pennsylvania. Could you please ask Ms. Herrington to return us to New York so we can continue to hold meetings? The thought of a three-or-so-hour commute to each meeting will reduce our enrollment quite significantly.

Frederic Finn, Chairman
Amuse Westchester

Sorry! We thought you'd like Pennsylvania, but if you really want to move back to New York, we'll pay your moving charges.

If none of the above makes any sense, then you probably didn't read Peggy Herrington's Amigaville column (July/August '87, p. 62), in which she states that a branch of Amuse is located in West Chester, Pennsylvania. They are actually located in Westchester County, New York, but you've probably surmised that by now.

—Editors

Help, Mr. Wizard!

Why, oh why, must I learn CLI? There are thousands like me who bought the Amiga because it comes close to delivering what the Mac only hinted at (a truly intuitive interface). If we'd wanted to learn cryptic, painstakingly entered commands, we could have dived into Big Blue and Associates. Commercial Amiga software does a fairly good job of realizing this, but most of this public domain stuff. . . come on! Surely, if you're creative enough to write the code, the Intuition interface can't be a problem. Or is it just laziness?

Commodore-Amiga development is to blame as well for leaving us halfway home. Without Workbench-based file management and utilities, that "Creative Edge" gets frequently dulled. This system was intended to be a quantum leap in human-machine interaction, and it is . . . sort of. The problem is that to unleash the real power of the Amiga, you have to resort to doing what all the other Stone Agers do—wear out your keyboard. Please, Mr. Wizard, I don't wanna be a programmer! I love my mouse, I love my icons, and maybe someday I'll love my direct neural bio-interface.

So how about it? Maybe we can take a leap forward without also taking a step back.

Paul R. Nickel
Omaha, NE

Amen!

Anybody who thinks MS-DOS is the place to be is lost in space! The Amiga 1000 already blows them away and now the new Amiga 2000 is going to bury them! If the 2000 lives up to everything it is supposed to, it will be unbeatable.

I have used some CP/M, an Apple IIe, the Commodore 8032, the C-64 and the Amiga 1000, and above all the Commodore systems have proven to be the easiest to use. Word processing in CP/M is like pulling teeth. Programming on the Apple is an uphill battle. Commodore continues to bring out highly competitive products at lower prices. Let us say Yes and Amen to the Amiga 2000 and look forward to the future of Commodore.

Gregory Benoit
Leominster, MA

Nothing New

What a concept! The Amiga 2000. Same processor. Same speed. Same flickering display. Same chip memory. Same buggy DOS with the same Guru, but locked in ROM this time. Fewer display options standard. Same diskette capacity.

There are better sound chips, better voice circuits, higher resolution displays, higher capacity disks and soon-to-be multitasking operating systems with real software support.

When I put down my deposit for the Amiga 1000, it was state of the art. I have already added memory, external drives, an expansion box and more. Since all this plus my modem and printer cables will not work with the 2000, and since the IBM compatibility is not a concern for me, this is not the upgrade I was looking for. When Commodore makes the new features worth the price and worth the loss of investment in my 1000 gear, then I will go for it. I really like the Amiga and its capabilities, but there is nothing in the 2000 that I don't already have.

Thomas Madura
Matawan, NJ

Send your letters to: Repartee, *AmigaWorld* editorial, 80 Elm St., Peterborough, NH 03458. Letters may be edited for space and clarity.■

Shipping Now

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Maximum level of sorts... 65,000
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Maximum no. of paths attached to one file... 16
Data types: alpha/numeric, date, time, logical
Field formats: standard IFF picture, customised
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System requirements: Amiga with at least 512K RAM and 2 floppy disk drives or a hard disk.

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Notepad

Amiga at COMDEX . . .

At this spring's COMDEX convention in Atlanta, Commodore made a strong showing with the Amiga 2000 and 500.

Commodore's press breakfast on the second day of the show was, among other things, a pep talk intended to reassure everyone that their recent management shakeup was all for the best. Chairman and CEO Irving Gould explained that CBM's "turnaround" mode had been carried too far, and that the time had come to move forward. Gould justified his new, more active role in the company by saying that now when things go wrong, he'll only have to look in the mirror to find the culprit.

Gould's long-range goal is to bring Commodore's U.S. operations up to par with their European counterparts. Al Duncan, a Commodore veteran, has returned to the company as General Manager of U.S. operations. From 1980–86, Duncan held top positions with Commodore, including head of the company's Italian and Canadian subsidiaries. Another important appointment as a result of the shakeup is that of Richard McIntyre as General Sales Manager. McIntyre has held various managerial positions with the company since 1980.

Much of the talk over breakfast concerned the positioning of the 2000 and the 500. The 2000, with its optional IBM compatibility, is clearly another Commodore attempt to appeal to business, but it's also aimed at vertical market niches. Duncan stressed the machine's suitability for CAD and other desktop design applications. Commodore bypassed the Consumer Electronics Show in Chicago in favor of COMDEX, reinforcing their intention to market the 2000 as a machine for business and professional applications. As for the 500, Duncan claims that it is another low-cost breakthrough, and he predicts its success will be similar to that of the C-64.

The most encouraging thing to come out of the meeting was a verbal commitment from Commodore to start advertising again, both on television and in print. Nothing specific was revealed, though.

Commodore also used COMDEX to introduce a refocused sales program. In an effort to strengthen sales and marketing, CBM has begun to expand direct manufacturer sales to independent computer retailers. As part of the program, Commodore is opening two new regional sales offices, one in Chicago and one in greater Philadelphia. The new emphasis is on direct sales, rather than distributorship-based sales.

At the Commodore booth, crowds were spilling into the aisles throughout the show. Most of the third-party developers with Amiga products to show were set up in Commodore's booth, creating a cluster of activity. Business and graphics were dominant. WordPerfect Corp. made the biggest splash, using the show as a launching pad for an Amiga version of their **WordPerfect** word processor. NewTek received a lot of attention with **Digi-Paint**, a 4,096-color paint program that lets you create original art, or manipulate Digi-View's Hold-and-Modify images.

—SL

. . . and CES

"No one really works at those shows," my friend told me before I left for the Consumer Electronics Show in Chicago. "They just go for fun and games in the big city." I can't argue with her. While everyone at the show *was* working hard, they were mostly playing games.

After seeing all the new driving games, I wondered whether I should cover the show for *Road and Track* instead of *AmigaWorld*. In Electronic Arts' **Ferrari Formula One**, you tune-up and race a Ferrari F1/86 on any of 16 international courses. **Test Drive** from Accolade lets you tear up mountain roads in a Ferrari Testarosa, Lamborghini Countach, Lotus Esprit Turbo, Corvette or Porsche. In **Roadwar 2000**, Strategic Simulations lets you act out your Mad Max fantasies by putting you in command of a road gang in post-bacteriological war America.

Leaving others to burn rubber, Activision and Firebird Licensees have taken flight. While Activision chose the familiar setting of the early-1900s barnstormers, Firebird's **Starglider** drafts you as pilot of an Airborne Ground Attack Vehicle flying through deep space.

From beyond the borders came Jagware from Canada with **Alien Fires** (a science-fiction graphics adventure that uses speech), Psygnosis from England with **Barbarian** (a Conan-like animated interactive adventure) and Micro-Partners from Germany with several multi-faceted, arcade-adventures in search of a U.S. distributor. From California came Epyx (actually Epyx came *with* California: palm trees, flowered shirts, shades, sandals and even a surfboard) with **California Games**, which tests your skills in surfing, skateboarding, rollerskating, BMX racing, frisbee throwing and the footbag.

While others emphasized graphics, Infocom maintained their successful tradition of text-only adventures with **Plundered Hearts**, a romance, **Nord and Bert Couldn't Make Head or Tail of It**, eight short stories, and **Beyond Zork**. Mindscape's new release, **King of Chicago** (mobsters, flappers and cement overshoes) continues the Cinemaware legacy, but rather than standing placidly while you talk to them, characters twitch, gesture and often pull guns.

While less flashy and adven- ►

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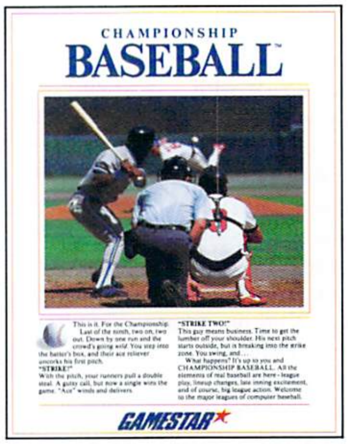
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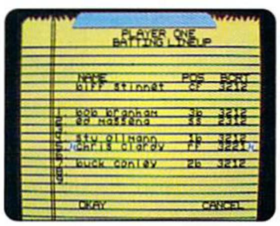
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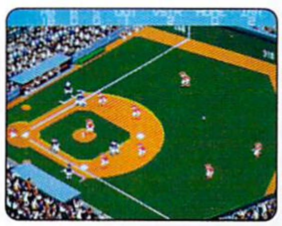
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GAMESTAR

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turous, the productivity software was equally intriguing. Accolade has ambitious plans. Their new paint program, **The Graphics Studio**, will be going head-to-head with Electronic Arts' DeluxePaint II. All the major paint and editing features are included at a lower price. Gold Disk didn't have a booth but sent a representative with a polished newsletter generated by their **Professional Page** desktop publishing system (see What's New? p. 92). Digital Solutions had a booth, but never sent a representative or samples of **LPD Writer**. Infinity Software had a booth *and* a representative *and* a color demonstration of their **Shakespeare** desktop publishing system (see What's New? p. 92), but not a finished product. Progressive Peripherals & Software gets the Completeness Award with a booth, several representatives, a working version of **VizaWrite** *and* some impressive hardware and software projects in development. To prepare you for word processing, Electronic Arts released **IntelliType**, a typing tutor.

With Commodore absent, few hardware developers were making noise. Only Phoenix Electronics was exhibiting hard drives (10, 20 and 40 MB). However, Amigas themselves were in abundance. If the number at the show was any indication, you should be seeing plenty of 500s and 2000s soon.

—LJB

A500, A2000, Sidecar Update

As shipping dates got closer, Commodore set the list prices of three eagerly awaited products—prices that in two cases are substantially higher than previously announced. The Amiga 500, originally announced at $649 now carries a $699 list price. The Amiga 2000 (originally $1,495) has been bumped 33% to $1,995. Finally, the Sidecar, the IBM PC/XT-in-a-box that gives the Amiga 1000 the ability to run MS DOS software, has been released in the U.S. at $999. When announced over a year ago at COMDEX/Spring in Atlanta, Commodore spokespeople said the Sidecar would sell for "significantly below $1,000."

While the A500 is already being discounted and the new price of the A2000 will help dealer margins, the price of the Sidecar doesn't make much sense. You can buy very fine IBM PC/XT clones (including Commodore's own) with more features than the Sidecar for hundreds less. One software developer, who prefers to remain anonymous, speculated to *AmigaWorld* that "Commodore isn't interested in selling many Sidecars, they just want to be able to say that they delivered a product they had promised."

As of June 18, the Amiga 500 was shipping to dealers, as was the Sidecar. The A2000 was expected to ship in July or August.

—RR

Noisy Bus

The Amiga community has rumbled for over a year with stories of people who can't attach more than one non-terminating peripheral device to the Amiga 1000 expansion port. The negative experiences of many Amiga owners has led some hardware manufacturers and developers to find out what was keeping their peripherals from working correctly with some Amigas and to come up with low-cost fixes.

As of this writing, most manufacturers feel that the problem with the Amiga 1000 expansion bus—specifically with its noisy data lines—originates on the daughterboard that contains the Writable Control Store (WCS). One developer speculates that the WCS was a last-minute addition to the 1000 because Kickstart was not ready to be cast in silicon when the Amiga was released. Commodore-Amiga came up with the WCS so that Kickstart could be upgraded easily (as has happened twice) when it was debugged.

Independently, many people have discovered that two of the four PAL (Programmable Array Logic) chips on the WCS daughterboard are not well grounded. This makes the chips susceptible to extraneous electronic noise. Others have discovered that daughterboards that use Texas Instruments (TI) PAL chips don't exhibit the same expansion bus problems as the daughterboards that incorporate (Monolothic Memories Inc.) MMI PAL chips. It's not that the TI-equipped boards are less noisy, just that the chips appear to be less affected by electronic noise than the MMI PAL chips.

For months, C Ltd. has sold a PAL upgrade to customers having problems with expansion devices. They remove two of the MMI PALs (DPALCAS and DAUGCAS) and replace them with TI PALs. Computer Systems Associates takes a different tack. For machines encountering bus problems, they recommend that the four daughterboard PALs be grounded together via a jumper connecting pin 10 of each chip. Some Amiga dealers take this procedure one step further by running a ground from the negative side of the C1 electrolytic cap to a secure ground like the metal shielding that encases the Amiga motherboard.

For Amiga 1000 owners having trouble with peripheral devices attached to the expansion bus, a PAL swap or additional grounding of the WCS daughterboard may be just what the engineer ordered.

—RR

National Computer Learning Month

Various activities and contests around the country will celebrate October as Computer Learning Month. The non-profit campaign, sponsored by leaders in the computer industry and education fields, will focus on schools to encourage students, parents, teachers and community leaders to "explore the potential of computers as learning tools." Two Senators, Lautenberg of New Jersey and Moorhead of California, are sponsoring bills to make the commemoration official.

Among the events planned are a time capsule dedication at the November Institute for the Transfer of Technology of Education, and national contests for students and teachers. Artwork, essays and "open-ended creative group projects," can be submitted by students; teachers can submit creative lesson plans that involve the computer. Prizes will be awarded by leading educators at the conference "Making Schools More Productive" in Dallas, TX, November 5 through 7. Prizes include donated computers and software. A large exhibit of student's computer artwork, including entries from the contest, is scheduled to make a national tour.

Newsletters, booklets, posters and computer store fairs will also accompany the celebration. Anyone who wants more information about activities, contests and prizes can write: Computer Learning Month, PO Box 19763, Washington, DC 20036-0763.

—VL

Random Access

Speculation about a trade-in policy allowing Amiga 1000 owners to upgrade to an Amiga 2000 (by turning in their CPUs and handing over $1,000) was rife at COMDEX and CES and on the networks. At press time, Commodore had yet to announce an official policy.

One music developer is saying that there is a switch in the Amiga 2000 and 500 that lets the low-pass filter pass frequencies up to 14KHz, double the highest frequency you can normally get out of Paula, the audio chip. No confirmation of this as yet from Commodore Engineering. ■

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Auto Notepad Reminder

If you are like me and always need to be reminded of things, here is an easy way to keep track of items. Since the new version of Notepad can be opened through the CLI, it can be included in the startup-sequence. Just add a line like:

```
NOTEPAD filename
```

before the LOADWB command in the startup-sequence. (See Sept/Oct 1986 for information on how to edit the startup-sequence.) This way, every time you start up your Amiga, the notepad will come up with your reminders. You can then edit them, add new items, etc., and when you exit the Notepad, Workbench will be loaded automatically.

Rodney Myers
Riverside, CA

Editor's Note: This one may require a bit of experimentation, so be sure to use a backup of your Workbench disk.

Basic Touch Tones

I am terrible when it comes to remembering telephone numbers, so one day I took out my Extras disk and began writing a small Basic program to store some names and telephone numbers on disk for easy retrieval. In addition, I incorporated a subroutine that automatically dials numbers for me.

Using the SOUND statement in Basic, tones can be produced through the monitor speaker. By selecting the proper frequency combinations, the generated tones are identical to those produced by a touch-tone telephone. So, all that my subroutine does is read the telephone number, one character at a time, and produce the appropriate tone. All I have to do is hold the handset of my telephone against the speaker of my monitor and the Amiga does the rest. (The local telephone company's central office must be equipped to process tones in order for this method of dialing to work.) The frequencies corresponding to telephone touchpads are as follows:

Number	Frequency (Hz)
1	697 + 1209
2	697 + 1336
3	697 + 1477
4	770 + 1209
5	770 + 1336
6	770 + 1477
7	852 + 1209
8	852 + 1336
9	852 + 1477
0	941 + 1336
*	941 + 1209
#	941 + 1477

To be on the safe side, tones should be produced for about .33 seconds followed by a pause of about .33 seconds. For example, if I want to dial the number 4, I could write the following:

```
SOUND 770,5,255,0
SOUND 1209,5,255,1
```

Notice that voices 0 and 1 are selected so that the sounds will be played simultaneously, thus producing the proper tones. With a bit of imagination, this concept could be used in conjunction with the built-in speech synthesizer for a variety of programming applications.

Peter Abreu
Miami, FL

Improved Color Printouts

I am using a Canon PJ-1080A printer and have found two things that improve the quality of my color printouts. These tips should work with most color printers.

First, if your printer can use any paper, try a commercial offset paper like Mountie Matt Dull (70 lb. text weight) or the equivalent.

Second, spray your printouts with Krylon clear acrylic spray. The result is a gloss finish with greater color saturation, improved contrast and a better sense of depth.

Andrzej Sikora
Chicago, IL

Interlaced Online! and Analyze!

Here is a helpful hint for users of Online! and Analyze!. To get them to run in 640 × 400 interlaced mode, simply type the name of the programs from the CLI, followed by an asterisk. For example:

```
RUN Online! *
```

This feature, as far as I know, is undocumented. It is especially helpful in Analyze!, as it allows you to view twice as many rows on the screen at once.

Another note for users of 1.2. Include the following command in the startup-sequence of your Online! disk:

```
SETMAP USA0
```

This will eliminate the problems of unwanted characters while using the VT100 terminal emulator.

W. Keith Edwards
Atlanta, GA

Flicker Solutions

There have been a lot of complaints about screen flicker while using the Amiga in the interlaced mode. If you don't have the money to go out and buy a high-persistence monitor, there are a few less expensive solutions. First, try placing a 14″ × 11″ × ⅛″ sheet of smoked Plexiglas in front of the monitor screen. Second, try wearing a pair of lightly tinted polarized sunglasses when working in the interlaced mode. Both of ►

these methods will greatly reduce the flickering without significantly altering the screen colors.

Gordon Zimmerman
Pittsburgh, PA

Editor's Note: Most people have heard both of these tips somewhere along the way, but there are probably people out there who haven't. When we hear about other solutions to the interlaced flickering problem, we will print them here (see the next tip), but we have to start somewhere.

Preference Flickering Solution

When I received my copy of Workbench 1.2, I felt like I had a brand new machine. One of the features that I wanted to try right away was working with the interlaced mode, but the flickers got to me. After much experimentation, I came up with what I felt was a good color combination in Preferences that reduced the flickering to a minimum. Set registers one through four like this:

1	2	3	4
R G B	R G B	R G B	R G B
0 4 6	0 0 0	0 0 9	15 0 0

First set a color to zero, then click the indicated number of times on the right side of the color slide bar. Register 1 is the leftmost register as is appears on the Preferences screen.

Scott Henderson
Edmonton, Alberta, Canada

Screen Shot Tips

When taking screen shots of your Amiga, there are a few tips you should be aware of.

First, be sure to level your monitor and camera before shooting (a small bubble level from a hardware store is perfect). This will help minimize keystoning. A telephoto lens (100mm or greater) will also help.

Second, for increasing contrast and cutting down on reflections, turn off all room lights when making your exposure. You might also try a polarizing filter on your lens.

Stuart Yamane
Honolulu, HI

Editor's Note: If your exposure is long enough, you should have no trouble at all taking screen shots in interlaced mode. No flickers on photos, you know.

Bulk Formatting Blank Disks

After buying several boxes of blank disks over a period of time, I found that it was easier to format them all at one sitting instead of "as required." This means putting in the blank disk, choosing Initialize, putting in Workbench, then the blank disk, etc., etc. An easier way to do this is to copy Workbench 1.2 System/Format and icon into RAM first:

```
COPY SYSTEM/FORMAT RAM:
COPY SYSTEM/FORMAT.INFO RAM:
```

Then open RAM disk, insert blankdisks, select blank disk icon (single click), hold down the shift key and double click the format icon. System request window opens, etc. If you have two drives, you can hold down the shift key and select both blank disk icons. This results in disks formatting one after the other. I recommend getting two System Requests (OK to Initialize?), drag first system request box off the other, then select "Continue" and "Continue." Formatting one disk takes about 1:50, two disks takes about 2:56, and Workbench is not required for every format.

Chris Sullivan
Sydney, Australia

Keyboard Buffer Update

Your March/April 1987 Hors d'oeuvres column gave a method for clearing the type-ahead buffer. Although it will work, it involved using a CALL to a subroutine of several lines. It is better to use the following line of code:

```
WHILE INKEY$ > "" : WEND
```

This method will execute faster, takes less program storage (after tokenizing), and is a lot easier to remember.

Mark Wooge
Omaha, NE

Editor's Note: Thank you to the many people who wrote in with the same idea. We opened Mark's letter first, so he gets the T-shirt.

Snooping Through Kickstart

The Kickstart disk contains the basic opperating system for the Amiga. It gets loaded into the Amiga at the top of its address space from memory locations 16,580,608 to 16,777,216. (Yes, you read it right, that is 16 million!)

While browsing around in the Kickstart program, some interesting things showed up. Try this. Load Amiga Basic and enter the following short program:

```
start = 16653596: quit = 16653672: CLS:
  WIDTH 67: PRINT
For j = start to quit
  PRINT CHR$(PEEK(j));
  NEXT j
```

The above start and quit addresses are for Kickstart 1.1. Substitute start = 16649670 and quit = 16649747 for Kickstart 1.2.

Steve Michel
Sterling, IL

Saving Custom Icons Update

In your March/April 1987 Hors d'oeuvres, Derek Buckley gives a relatively complex method of keeping the same icon after you have created a new one. Normally, Basic will erase the old icon when you resave the program, but this can be avoided simply, and permanently, by typing:

```
PROTECT programname.info R
```

This sets the protection status of the info file, where the icon is stored, so that the info file cannot be deleted until the protection is changed back (PROTECT programname.info RWD). In this way, Amiga Basic leaves the icon alone, without the need for swapping files around each time the program is resaved.

Joshua Goodman
Quincy, MA

Function Key Templates

While using my Amiga this morning and thumbing through pages of books trying to find what the different function keys do, I came up with an easier way.

Take a 9.75″ × ⅝″ × 1⁄16″ piece of wood (found at most hobby stores that deal with model airplanes). Tape (with clear tape) typed labels cut from paper onto the strip of wood, and on the back, put another label describing what disk or program the template is for. The wood fits perfectly in that slot just above the function keys, and it won't curl up the way paper or cardboard does.

Tim Salt
Bountiful, UT

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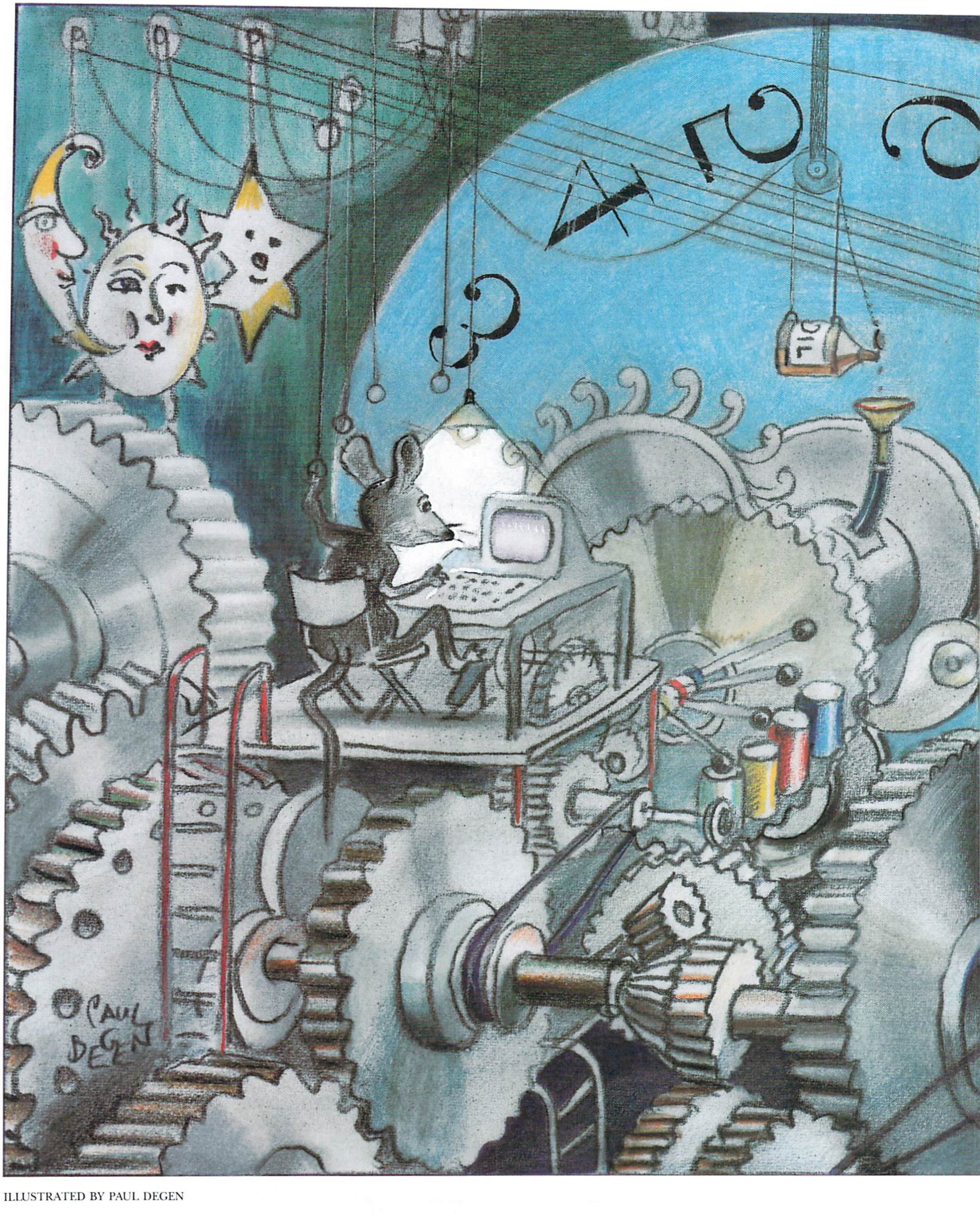
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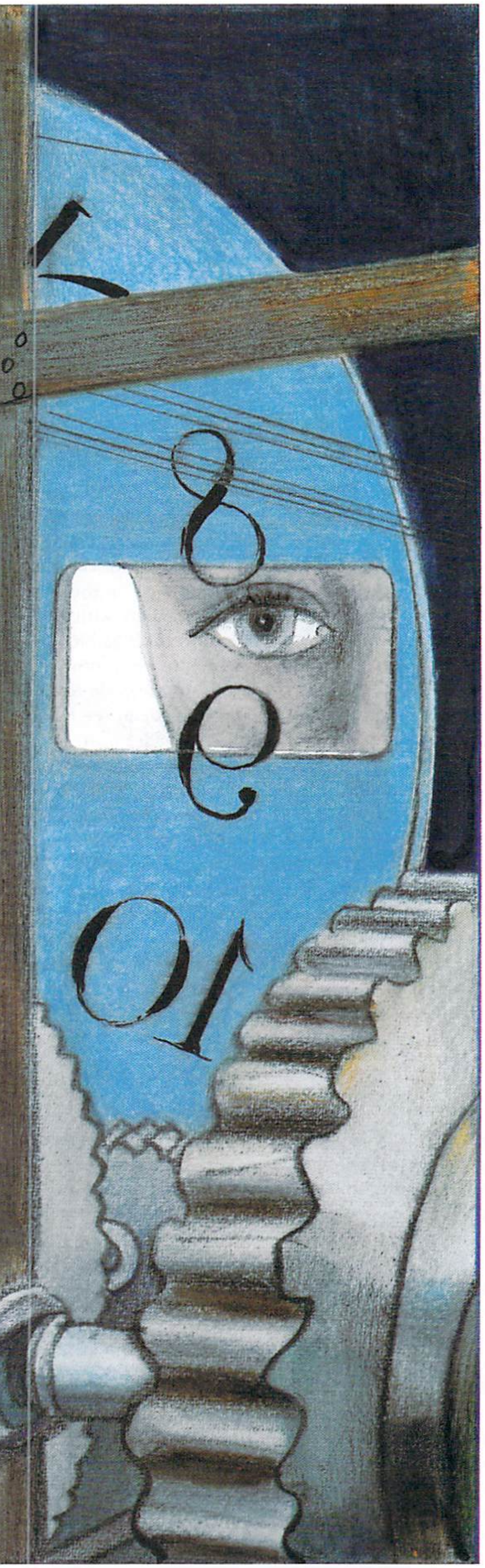
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1,001 1,002...

four clock/calendars for the 1000

By Sheldon Leemon

THE AMIGA's operating system, like the IBM PCs, keeps track of the time of day and the date. AmigaDOS even stamps each data file that you save to disk with the time and date of its creation. This feature can be extremely useful for business applications; if you're using an accounting program, for example, you must make sure that entries are dated correctly. And if you have several versions of a letter on file, it can be very handy to look at the date stamp and see which one's the latest.

Unfortunately, the Amiga 1000, like the early PCs, only retains the date and time as long as the computer is turned on. (That's the reason for the friendly reminder message "Use Preferences tool to set date" that you see whenever Workbench is first inserted.) If you want the computer's internal clock to be set to the correct time and date, you've got to enter that information each time you turn the computer on. Unless, of course, you attach a hardware device known as a clock/calendar.

A clock/calendar, also called a realtime clock or battery backed-up clock, is a little device consisting of a computer chip or two and a battery. It keeps track of the current time and date, and can communicate with the Amiga so the computer can set the time and date, or read the time and date from a pro-

gram. Because of the battery, the time and date settings remain current even when you shut the computer off. Then, when you turn it back on, a command issued from your startup-sequence file causes a program to automatically read the time and date from the clock, and use that information to set the computer's internal clock.

The Amiga 2000 has a clock/calendar built into the motherboard of the computer, and the Amiga 500 has one built into its optional internal RAM expansion board. But since Commodore doesn't make a clock/calendar for the Amiga 1000, a number of third-party hardware developers are producing clock/calendars for the A1000. In some cases, the clock/calendar is just an extra feature added to another hardware device. For example, the PAL jr. expansion box from Byte by Byte contains a clock/calendar along with a hard disk and memory expansion. The Supra hard-disk controller box contains a clock/calendar, as does the Insider memory expansion unit from Michigan Software. And the MicroBotics Starboard 2 memory expansion box contains a socket for a multifunction card that features a clock/calendar and 68881 floating-point math coprocessor socket.

However, even if you don't buy a hard-disk drive or a memory expansion card, it's possible to get a standalone clock/calendar attachment for your Amiga. A number of companies make these clocks, and all keep reasonably good time. The four units reviewed here are A-Time from Akron Systems, TIC from Byte by Byte, Mousetime from MicroBotics and Keysaver from C Ltd. Each clock attaches to the A1000 in a different way and has slightly different features, which you should keep in mind before deciding to buy.

A-Time

In early 1986, Akron Systems Development (ASD) brought out A-Time, the first clock/calendar for the A1000. A-Time comes in a beige plastic case measuring about two inches wide by three inches high. On one side, there's a female DB-25 connector that fits into the computer's parallel printer port. On the other side, there's a male DB-25 connector which serves as a pass-through for the Amiga's printer port.

When you first turn on the computer, A-Time is active, which means that any signals sent to the parallel port go to the clock. However, once you run the program "Read-RTC," which reads the clock, A-Time is made inactive, and any signals going to or coming from the parallel port pass through transparently, as though A-Time wasn't there. In most cases, you'll put the Read-RTC instruction in your startup-sequence file, so that the clock is read and disabled whenever you start up the system. But even if you use a disk that doesn't use the Read-RTC program to disable the clock, it will automatically be disabled when you start sending output to the printer. In such a case, your printer may miss the first couple of characters sent. When A-Time is inactivated, it's not possible to read or set the clock until it's activated again. That happens whenever you turn the computer on again, or reset it by using the "Control-Amiga-Amiga" key combination.

A-Time is simple to install—just plug it into the printer port and plug your printer into it.

A number of parallel devices such as printers, the Digi-View digitizer, the MicroBotics MAS-20 hard drive and the FutureSound audio digitizer have been tested with A-Time. Just as long as A-Time is connected directly to the computer, rather than to a pass-through provided by another device, both devices should work correctly. Although the first version of A-Time conflicted with the positioning of the Genlock interface, a newer version that hangs *up* from the parallel port, not down, has been available for quite some time. Owners of the original A-Time who want to add a Genlock can update their clocks for a modest fee.

As with the other devices reviewed, A-Time is simple to install—just plug it into the printer port, and plug your printer into it. No instruction manual is included with the clock. Instead, all of the instructions appear as text files on the floppy disk, which contains the programs used to read and set the clock. Although the instructions and the programs are easy to follow, they can only be accessed from the CLI, which poses a problem for the absolute beginner. Since the disk doesn't contain a batch file to alter the startup-sequence on the Workbench, you need to have some familiarity with editing text files as well, in order to add the Read-RTC command to the startup-sequence. For the even more sophisticated user, ASD has made the source code for its software available, so that programmers can see how to read the clock directly through the parallel port.

It's possible to open up A-Time by removing two screws. Inside is a circuit board that contains a 3-volt lithium battery in a holder. These batteries typically last for several years, but even so, it is possible to change the battery should the need arise. Harry Evangelou of ASD claims that A-Time keeps time much more accurately than some of the other clocks, but frankly, we'd need a fairly large sample of each unit to prove or disprove his claim. Nonetheless, we can award A-Time the prize for most interesting circuit-board etch: The foil side of the board reads "Hi Mom! Made in the USA with high-quality Japanese parts."

TIC

TIC, from Byte by Byte, is a black plastic cube that measures 1 ¾″ × 1 ¾″ × ¾″, and plugs into the second mouse port. It comes in a neat plastic case that looks like a videocassette holder, and like A-Time, its instruction manual is also on disk. The method of presentation, however, is much more sophisticated than that of A-Time. All of the programs and information on the disk may be accessed using icons on the Workbench. The manual is displayed by means of a demonstration version of InfoMinder, a program (also from Byte by Byte) that presents data from a series of menus. The data is formatted as a combination of formatted text and IFF pictures, so that diagrams can accompany the text. Although InfoMinder itself may be confusing at first, the manual itself is clear, and well-suited to the beginner. The setup instructions are quite simple, and there's even a program that alters the startup-sequence file on your Workbench disk so that the time is set

from the clock automatically on power-up. TIC also comes with a modified version of the Workbench Clock program that lets you set the time by using the mouse to move the hands of a clock that appears on screen.

Although TIC is attractively packaged and well presented, there are some potential problems with its design. Most serious is the fact that there are physical conflicts between TIC and some of the add-on memory cards that go into the expansion port next to the joystick port. There just isn't enough room to plug TIC into the port when a Starboard, Comspec or Alegra memory board is already plugged in. There are several work-around solutions to this problem, but none are perfect. The latest version of the TIC software will recognize the clock if it's plugged into the front mouse port, and then switch the ports via software, so that you can operate with the TIC in the front port and the mouse in the back one. Unfortunately, some software, such as those protected with a hardware key ("dongle"), like Publisher 1000, Superbase and Acquisition, won't work correctly in this mode. The other solutions are to make a short extension cable, or to take the TIC out of its case. Since TIC uses press fittings, it's relatively easy just to pry the case apart and remove the circuit board. This frees up enough clearance space on the side of the board to make it fit. By the way, once inside, you'll find that TIC's battery appears to be soldered in, and can't be changed. This shouldn't be a problem, since lithium batteries can last for years.

The other potential problem with TIC is that it occupies the spot normally used by joysticks or dongles. Byte by Byte has made TIC easy to plug and unplug, so it's possible just to take it out when you need the port, but if you use programs that need the port on a regular basis, you may find the plugging and uplugging to be a hassle.

MouseTime

Another clock/calendar that uses the second mouse port is MouseTime from MicroBotics. Unlike the square, black TIC, which hangs from the port, MouseTime comes in a tall, Amiga-beige metal case that reaches from the port to table. Although it plugs into the same port as TIC, MicroBotics has taken some steps to avoid the two potential problems mentioned above. First, though MouseTime is as wide as TIC, the joystick connector is mounted off-center, so that the clock fits in regardless of what's attached to the expansion port. The other difference is that the back of MouseTime has a male joystick port pass-through connector. This means that you can plug your joystick or dongle right into MouseTime, without having to remove it.

As with A-Time, when you turn on your computer, MouseTime is active, and blocks any signals sent through the joystick port. Normally, your startup-sequence file would issue the "MouseTime" command, which is used to read the clock, and that would deactivate the clock. When the clock is not active, the port passes through signals transparently. Even if the clock is not read, however, it is deactivated when the button on the joystick plugged into MouseTime is pressed.

While inactive, MouseTime is transparent enough to allow dongle-protected software to work without any problems.

One important difference between the system used by A-Time and that of MouseTime is that while the parallel port contains a reset line, the mouse port doesn't. This means that while A-Time is reactivated each time you warm start the computer (with the Control-Amiga-Amiga key sequence), once MouseTime is inactive, it can't be read by the computer until you power down again, or until you unplug and replug the unit (which is not recommended). While inactive, MouseTime is transparent enough to allow dongle-protected software such as Superbase and Acquisition to work without any problems.

MouseTime comes with a disk containing software to read and set the clock, and a single printed sheet of instructions. While not quite as sophisticated as TIC's setup, the instructions are clear and to the point. The software used to set the clock is mouse-driven, and the disk also includes a batch file that can be used to alter the user's Workbench disk to include a MouseTime command in the startup-sequence.

TimeSaver

Just when you thought that you'd seen a clock stuck on every port possible, along comes TimeSaver, an innovative clock/calendar and keyboard enhancer from C Ltd. that hooks into the keyboard line of the A1000. Though TimeSaver is much more than just a simple timepiece, it's priced so closely to stand-alone clock units that it deserves consideration by anyone who's planning to add a clock/calendar.

TimeSaver comes in a large cardboard tube that also contains a very complete 100-page instruction manual. The actual TimeSaver unit comes in a plastic case about four inches long and an inch and a half high. TimeSaver has two modular phone jacks on its side: one cord goes from it to the Amiga keyboard jack; the other receives the plug from the Amiga keyboard. The case press-fits into a recess on the underside of the Amiga that seems to have been made for it. Once installed, it stays completely out of sight, and out of the way.

Because of its unique location between the keyboard and the computer, TimeSaver is in a position to intercept every keystroke before it's sent to the computer. This makes it the perfect vehicle for keyboard macros. Keyboard macros are combinations of two or more keys that are translated into whole strings of characters. For example, if you hold down the HELP key and press the letter D, TimeSaver sends the string Diskcopy DF0: to DF1:<return>, just as if you'd typed in the whole string of letters yourself. The unit comes programmed with a number of these macros already in permanent ROM. In addition, there's about 7K of battery backed-up RAM that you can use to create and store your own macros, using just about any two-key combination that you like. Once you set TimeSaver into "learn" mode, any key that you press thereafter is saved, until you press the HELP key again. That includes the Amiga-Arrow key combinations that move the mouse. This makes it possible to program TimeSaver to make menu selections, as well as typing oft-repeated phrases! ►

Usually, keyboard macros are programmed through software, which means that the macro program must make sure that it gets to the keyboard input before any other application program. And in some cases, the macro program and the application may want to interpret the same keystrokes differently, leading to conflicts. But since TimeSaver literally takes over the keyboard, its macros are compatible with any program that uses the keyboard. And because they're in hardware, they're always there when you turn the computer on. If the macros use the same key combinations that an application uses, it's possible to temporarily override the TimeSaver definitions, or to turn them off completely. In fact, it's possible to turn off every TimeSaver function completely, except for the one that intercepts the Help + 0 key combination, which reactivates TimeSaver.

As you might have guessed by its inclusion in this review, TimeSaver also contains a clock/calendar. Unlike any of the other clocks reviewed here, however, it needs no special software to set the computer's clock from its own internal timepiece. Instead, when you press the HELP and F5 keys together, it sends an AmigaDOS DATE command with the current date and time. For example, if it's 6:00 pm on May 14, 1987, TimeSaver would send the phrase:

Date 14-May-87 18:00<return>

As long as you have the AmigaDOS DATE file in the current directory or c: directory, the correct date and time is set.

TimeSaver can even set the time and date automatically, each time you reset the computer, by means of some electronic trickery. When the keyboard (and TimeSaver) receives a reset signal, TimeSaver waits a few seconds, then sends a CTRL-D key sequence. That signals the CLI to abort the s:startup-sequence batch file, which normally loads the Workbench program. Then, TimeSaver sends the DATE command. Finally, it sends the command "Execute s:startup-sequence", which causes the batch file to execute normally. This means that you don't have to alter the startup-sequence file on all of your Workbench disks so that they'll work with TimeSaver; you can insert any disk that has the DATE command in either the root or c directories at startup time, and the date will automatically be set. The only time that this system doesn't work is if you wait a while between the time the Workbench prompt appears, and the time you insert the disk. In that case, you can enter the time from the CLI with the HELP + F5 function.

Although priced a little higher than the other clocks, TimeSaver does so much more that most people would consider it worth the price.

In addition to automatically interrupting the startup batch file and issuing the DATE command, TimeSaver has a couple of other "automatic" functions that it can perform at startup time. You can set it to automatically execute one of your keyboard macros. This allows you, in effect, to set up a specialized startup-sequence of commands that will execute automatically on power-up, regardless of what disk you start with. And, you can set it to automatically request a password on powerup. This is a four-key combination that you must enter in order to "unlock" the keyboard. Until you enter the code, TimeSaver won't let any keystrokes through to the computer. In fact, if you forget your password, you'll have to disconnect the battery so that it will "forget" it too. Although the determined intruder could find and unplug the TimeSaver unit, this kind of password protection is likely to deter any casual snooping. You can also engage the password protection at any time, using a keystroke combination, which helps to guard against prankish tampering when you leave your desk for a moment. As with most other TimeSaver functions, you can turn any of the automatic functions on or off to suit your needs.

If this were a late-night commercial, just about now the announcer would say ". . . but wait, there's more. . . ." And there is. TimeSaver provides two additional functions that help make the CLI environment easier to deal with. The first is command line editing. This enables you to use the arrow keys to move the cursor back to a mistake in the command line, and fix it. The second of these features is called command history. TimeSaver uses 1K of its RAM to save the last 1,000 keystrokes, and allows you to retrieve them, one line at a time. This allows you to easily repeat previous commands, or to call them back and edit them.

Although priced a little higher than the other clocks, TimeSaver does so much more that most people would consider it worth the price even if it didn't have a clock. The hardware keyboard enhancer is such a clever idea that it's amazing nobody thought of it before. If you use the keyboard at all, you'll find it well worth the extra 20 or 30 dollars. And with TimeSaver, you can be sure that your clock is connected to the one port that no other peripheral will need to use. ■

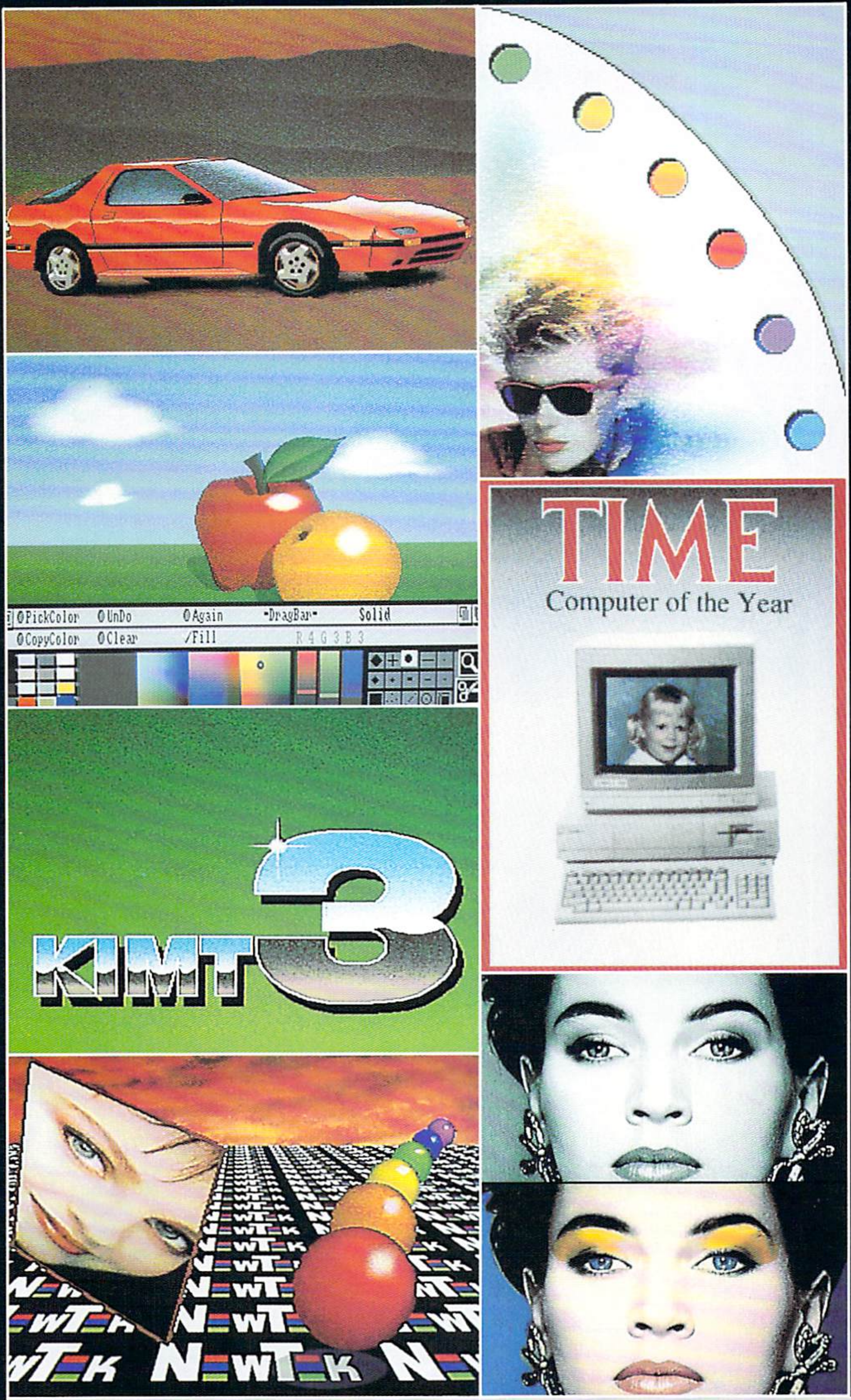
Company List

A-Time ($59.95)
Akron Systems Development
PO Box 6408
Beaumont, TX 77705

TIC ($59.95)
Byte by Byte
Arboretum Plaza II
9442 Capitol of Texas Highway N.
Suite 150
Austin, TX 78759

MouseTime ($49.95)
MicroBotics
811 Alpha Drive
Suite 335
Richardson, TX 75081

TimeSaver ($79.95)
C Ltd.
723 East Skinner
Wichita, KS 67211



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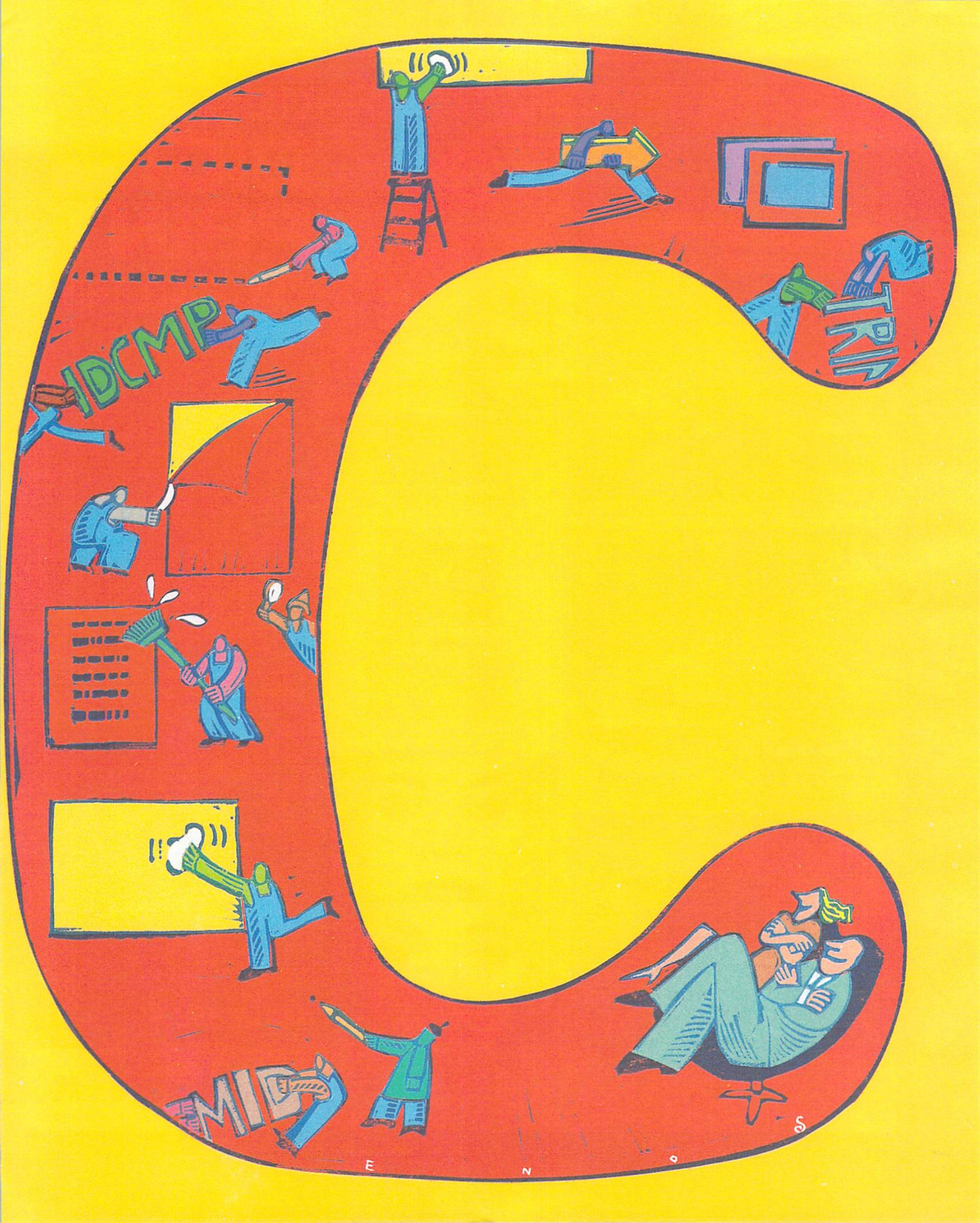
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C Programming Utilities

How to get by with a little C from your friends.

By Louis R. Wallace and David Darus

Programming the Amiga in C *is* as complex as it seems—if you write all the code yourself. So why not let the machine generate it for you? Many programming utilities on the market will do just that. To help you program quickly and productively with the Amiga's Intuition operating system and ROM Kernel routines, you can buy programming tools that let you design screens, windows, menus or gadgets on screen. These utilities then write the C code segment needed to create the structure; all you have to do is insert the code into your program. Other utilities offer compiled functions as object code for you to link to your programs. You simply make the function calls with the proper parameters. In some cases you need virtually no knowledge of the Intuition system, beyond basic C techniques and which function calls to supply.

The "black box" approach to programming, calling ready-made subroutines, will help amateurs and intermediates write programs to perform complex tasks that would normally be beyond their abilities. You should be careful not to become dependent on the crutch of programming tools, instead of developing the skills needed to go beyond the rudiments of the Amiga operating system. However, if you want to get the job done quickly or you want to write some Amiga-specific programs but aren't interested in becoming a programming wizard, using these refined techniques may be just what you need.

Power Windows

Power Windows (Inovatronics Inc., $89.95, 512K required) is a menu-driven utility that allows you to design windows, specify their characteristics, such as size and position, and add text to them. For communication between windows or other tasks, you can also include IDCMP (Intuition Direct Communication Message Port) flags. In addition, you can quickly add menus and gadgets of several types.

You access Power Windows by either the CLI or the Workbench, and begin with a blank borderless window—the PW Command Window—and the Project menu. From here you can open a new window, edit an old window or exit the program. If you choose to open a new window, a small window appears. The Project menu disappears and is replaced with five new menus—File, Window, Menus, Gadgets and Preferences. From these menus you can customize your newly created window.

The File menu has four options. Save Editable File saves the window and all its options to disk for later recall and editing. The Write C Source option writes a C code sequence that, when included into your own program and compiled, reproduces the window quite faithfully. Similarly, the Write Assembly Source option from the File menu creates a 68000 assembly source file. The source code is in ASCII, so it can be edited by any text editor. Quit sends you back to the Project menu.

The Window menu allows you to edit the characteristics of the window currently being constructed. You can edit the text in the title bar with the Change Window Name option. Edit Window Characteristics opens a new requestor window with a large list of options. You can specify the detail and block pens, the minimum and maximum window sizes, choose from 23 IDCMP flag options and choose from 15 window flags (WINDOWSIZING, WINDOWCLOSE, WINDOWDRAG, SUPER_BITMAP, GIMMEZEROZERO, etc.). The other options in the menu concern the placement and characteristics of text within the window. You can change the fonts, drawing modes (JAM1, JAM2, COMPLEMENT or INVERSVID) and front and back pens used to render the text. Windows always have a drag bar and sizing gadget during the design, so you can position them and determine a default location. However, to incorporate these gadgets in the C code created for the window, you must request them explicitly.

Menus are covered thoroughly by Power Windows. You can Append one or several menus to a window, ►

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then use the other functions to create menu options under the new heading. You can also use the Insert A Menu option to add another menu title between existing ones. Once the headings are created, Work On Menuitems allows you to select the number and titles of the subitems in that menu. From here, you can also add sub-subitems. You can change the characteristics of the subitems with the Options For selection, specifying color, text and an alternate command key.

Gadgets have their own menus, of course. You can easily add a gadget, move it, clone it, re-size it or add text to it. You can also define the gadget type you are working on. Choose from string, integer and boolean by simply pointing with the mouse. There are 14 gadget flags as well as four relativity flags available. You can also specify a string up to 80 characters long, and its color and placement.

The Preferences menu allows you to turn on and off the OK prompts, gadget collision checking, source code comments and source code spacing.

Power Windows is an easy-to-use utility that takes the drudgery out of menus and gadgets.

When the window, its menus and gadgets have been defined, save the editable file to disk. Once saved, you have the program create the C or assembly source that describes the window you have designed.

Power Windows is a well-written, easy-to-use utility that takes the drudgery and complexity out of menus and gadgets. It does not allow you to design windows, menus or gadgets that take advantage of more than two bitplanes (the Workbench screen is used) although you can, of course, edit the source code that is generated. We liked it, and found it useful. Since the program simply creates source code, you can edit the code to make it work with Lattice (versions 3.02, 3.03 and 3.10) as well as the Manx C compiler. The program is menu driven, so while the documentation is quite sparse, it is sufficient.

Intuiseeds

Intuiseeds (Greenthumb Software, $69.95) is a collection of C functions designed to expedite programming the Amiga's Intuition system. It is supplied as a library and some include files that are linked together with your programs at compile time. Intuiseeds' 23 functions cover most of the requirements for opening and closing screens and windows, as well as defining menus and gadgets.

To define a screen, you simply define a structure and call the BldScreen function. The parameter list for the screen specifies the left and top edges, the height and width, pointers to structures for text attribute and a title string, colors for the detail and block pen, the desired viewmode and a pointer to a bitmap structure. The viewmodes can be HIRES, LACE, SPRITES, DUALPF or HAM. To open a window, call BldWindow. The major difference between BldScreen and BldWindow is the use of IDCMP flags. No viewmodes are required, of course, since windows share the characteristics of their host screen.

If you want to make a requestor, use the BldReq function. Simply call it with the eight parameters defined and the requestor is built. Or, if you want to build a menu, call BldMenu, a simple function with only four parameters. The first, a pointer to a text attribute structure, defines the font used. The next paramenter is a pointer to a list of menu header names. This menu header structure also contains information about which options are to be used, like checkmarks, highlights, XOR (exclusive OR) or even which options are enabled/disabled. The final two parameters are pointers to lists of items and subitems (if any) as well as their own options. While this method is much simpler than defining the menus by building the structures directly, it is more difficult than the Power Windows approach.

The largest group of functions in Intuiseeds is concerned with gadgets. BldGadg allocates and builds a gadget structure and adds the gadget to the current object's (a screen, window or requestor) gadget list. BldButton constructs a boolean-type button gadget. BldPropInfo designs a proportional info structure. BldStick creates a proportional gadget that has horizontal and vertical mobility, great for emulating joystick control. BldHPot makes a proportional gadget that has horizontal motion only. Many programs use this type of gadget as a controller to change colors or volume. Likewise, BldVPot creates a proportional gadget that has only vertical mobility. Word processors use vertical proportional gadgets to scroll up and down through a document. Two string-gadget functions, BldStrInfo and BldStrGadg, are used for gadgets that input text information. To input numeric information, use BldNumGadg.

One command handles several types of memory management. MemMan allows you to allocate and deallocate a given amount of RAM. You can also specify the type (CHIP, FAST or PUBLIC) of RAM.

IText creates an IntuiText structure. This structure contains information about the foreground and background pen color, the drawmode (JAM1, JAM2, COMPLEMENT or INVERSE) to use, plus the font and the actual string information. The TxLength function returns the length (in pixels) of a text string.

There are also functions for building a Border structure and an Image structure. Especially useful, BldImage allows you to define the number of bitplanes, the PlanePick (which bitplanes get the image data) and the PlaneOnOff (which planes don't receive the image data), among other things.

The Intuiseeds manual is about 50 pages long and contains a brief introduction to using the system in a few examples. The bulk of the documentation is a command encyclopedia, explaining each function call and its parameters. Again the descriptions are terse but to the point.

Do we like Intuiseeds? Yes and no. For what it does it works well. We don't like the fact that we have no way to customize the functions since Intuiseeds provides object code, not source code. We especially don't like the fact that the two Lattice compilers it supports (3.02 and 3.03), are the worst available. Perhaps updates will be available that will support Lattice 3.10 and Manx C compilers, which would make the package much more useful to serious programmers. However, the two ear- ►

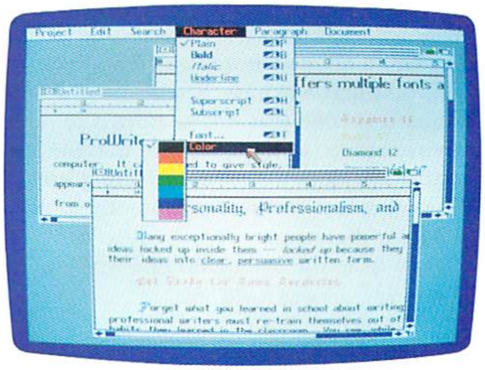
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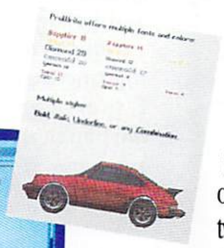
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lier versions of Lattice are probably the most widely used, particularly by the beginning programmers who will most benefit from this package.

AmigaView

AmigaView (ACDA Corporation, $79.95) is a collection of nearly 100 functions and macro routines that offer an in-depth alternate programming interface for using Intuition. Unlike Intuiseeds, these are somewhat lower level access functions that offer a larger degree of control, but require a more detailed knowledge of the Amiga. The package consists of object code (linkable at compile time to your program) along with a functional drawing program called ImageTool (used to generate C code segments for use as images within your programs).

AmigaView has over two dozen routines for screens and windows. They allow you to create and open them at any legal size and resolution. In addition, you have easy access to control functions like screentofront() or windowscroll() as well as mouse position within the screen/window.

Among the 20 procedures for using menus and gadgets, you'll find functions for creating and defining menus, and many more for defining gadgets and attaching them to the screens and windows. All types of gadgets are available, from string and integer to button and proportional.

There are also about a dozen routines for using the drawing functions. From a simple point to polylines, all are available, as are pattern definitions.

About 18 functions concern themselves strictly with event processing. AmigaView allows handling of multi-input events from several windows simultaneously, often a difficult programming chore by itself. These events can be simple mouse events or complex menu item selections.

Some of the program's macros and procedures implement the layer functions, another tricky programming chore. Others handle requestors, memory allocation and border rendering.

AmigaView seems to be aimed at the professional or intermediate programmer. While ACDA claims that any C programmer without prior Amiga experience can immediately take advantage of the graphics, we feel only someone with a clear idea of the Amiga operating system could effectively use this package (without taking many trips to meet the GURU). However, if we were to use a linkable object library, we would choose AmigaView. It contains support for both Lattice 3.02 and Manx 3.30, but we were told that Lattice 3.10 support is forthcoming. ACDA also plans additions such as IFF save/load support and packages such as sound and multitasking macros.

Key To C

Key To C (Data Research Processing Inc., $34.95) is a collection of 125 C functions that you can use from within your programs. Unlike the previous three utilities, very few of the Key To C funtions have anything to do with Intuition. Instead, they are mainly data manipulation functions, although there are some for screens, windows and drawing. They are supplied as linkable object code (in a library) and as C source code. With a little editing, the source can be made to work with any Amiga C compiler.

Key To C provides the benefits of high-level functions and the speed of compiled C programs.

The logic behind Key To C is that, unlike Basic, C has very few predefined functions. Basic has an undeniably rich array of high-level functions that can be implemented in C, but it would take some time to do. Key To C is meant to supply these types of functions to the C programmer, providing the benefits of the high-level commands and speed of compiled C programs, without the hassle of writing the routines yourself.

Key To C offers many type-conversion functions. For example, you can easily translate a hex number to integer (short or long), ASCII or ASCII strings. You can convert binary numbers to hex, ASCII or integer. There are even octal conversion functions. You also get an absolute value function for floats and integers and random number generators. There are 13 functions dedicated to testing a character to see if it is an integer, character, control, punctuation, a space, upper or lower case, or if it is printable at all. Of course you could write these yourself, but they are a pain to do, and if the code is already there, why bother?

Several functions pad the left or right side of a text string with spaces, which is very useful for formatting output. Conversly, TRIM() lets you remove leading or trailing spaces. There are Basic-like string functions such as MID, LEFT and RIGHT string, used to check for substrings with a main text string. Nine commands concern themselves with time of day or building formatted date strings like DD-MM-YY.

For graphics, the program includes functions to open and close screens and windows of any resolution. There are some simple, but essential, drawing commands like color, box, boxfill, line, pena, penb, point and printg (print text string in graphic windows). No mouse, IDCMP or animation support routines are included, so if you want these you will have to use Intuition.

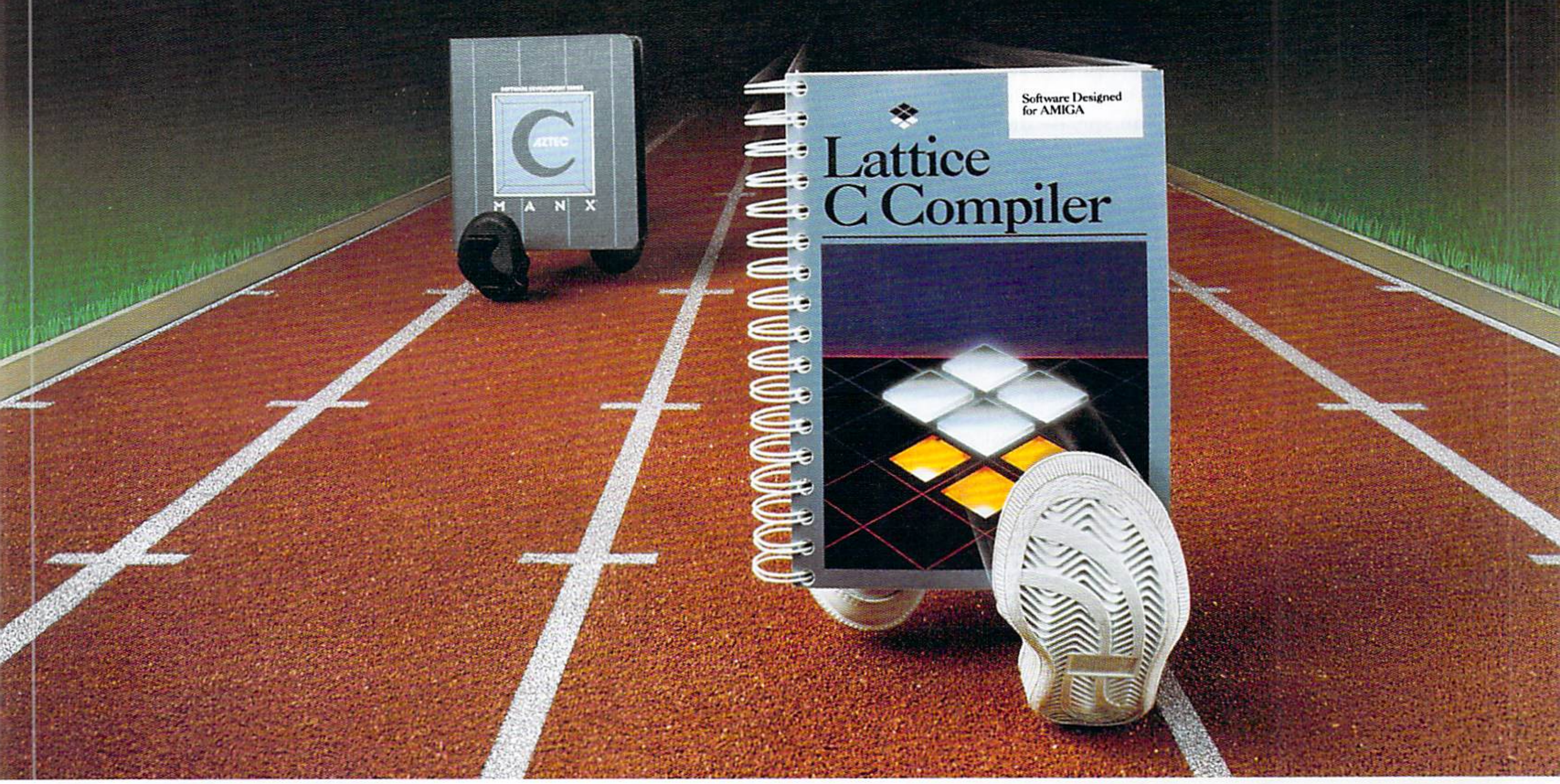
The documentation is about 70 pages long, with each function and parameter list defined. It is sufficient for most purposes, and of course the source code is available if you need to see or modify how a particular function works. We found Key To C to be a very good, very useful, reasonably priced set of routines. While we wouldn't use it for its Amiga graphics support, the data type manipulation functions, plus the string functions, are well worth the price. In addition, we really like having the source to examine or modify as needed.

Lint

Lint (Gimpel Software, $98) is a C source code debugger that will find errors before you compile or those that the compiler may miss. It is also useful when you need standard C code that will be ported to other computer environments, as it makes sure that the code is fully standard C. It does no error correcting itself, but alerts the programmer to real or potential problems through error messages.

Lint is invoked from the command line with the form ►

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lint options file1 [file2 file3 . . .

where the options can be error inhibition codes that prevent Lint from listing everything it finds wrong. Or the options can be size options. You could, for example, specify a byte to be other than eight bits or a type char to be longer than one byte. More importantly, you can specify the size of a float, int, double or long. While you may never need this in the Amiga's 68000 environment, it is useful for programs that may ultimately run on another machine.

You can specify the verbosity of the work-in-progress messages, or flag various problems. The pointer-difference-is-long flag specifies that the difference between two pointers is long, otherwise it is type int. Another option is –fnc, which allows nested comments. If you are using a nonstandard K&R C compiler, you may be able to use duplicate (conflicting) member names in different structures. For example:

```
struct a { int x; float y; } s1;
struct b { float y; int x; } s2;
```

This is allowed by most compilers, but not by the K&R standard. If you want your code to adher to the stricter K&R, then use +fum to instruct Lint to generate an error message if this was found. These are merely simple examples of the many different types of flags and options available. Once Lint is set up with the options you desire, it's as simple to run as invoking the command and evaluating the output.

Lint is not for all C programmers; it's for those professionals or serious amateurs who want to write very high-quality, bug-free code in a variety of environments. It is extremely flexible; half of the 75-page manual is devoted to the scores of command line options. When deciding to buy Lint, you must consider what sort of programmer you are. For example, David, a professional programmer concerned with portability, would use Lint much more than Louis, who likes to write machine-specific code. Being serious programmers, however, both of us will use it to some degree or another.

With MetaScope, you can enter small assembly code segments directly, bypassing the need for an assembler.

MetaScope

MetaScope (Metadigm Inc., $95, 512K recommended) is an application program debugger and disassembler. It is not really a C programmer's utility, as it works with an already compiled (or assembled) program, not the generation of a program. Since it allows you to follow the progress of code as it executes in the Amiga, MetaScope is helpful to the advanced C programmer as well as the assembly level programmer. To get any use out of MetaScope, you must have a working knowledge of 68000 assembly language. Using the Amiga's windowing environment, it disassembles and monitors the program flow, allowing you to examine or even modify the program, its data and register values.

There are several types of windows in the MetaScope system. For example, the Status Window shows the contents of your program's registers, as well as the program counter and conditional code values. In one line it shows the disassembled 68000 instruction at the current program counter position (in assembly language, not C). The Memory Window is used to display the data contents of memory addresses. Break Windows show the current breakpoints in address order, with the information for a single breakpoint on each line. You can specify several breakpoints using a conditional statement, which is also displayed. Since it is often important to know the number of times the breakpoint has been reached, you can also display a breakpoint count.

Hunk Windows display information about the various hunks of your program in the Amiga's memory. (Since the Amiga is a multitasking machine with dynamic memory allocation, a program may not always reside in contiguous RAM. If so, it is loaded in scattered portions called hunks. Sometimes the compiler/assembler decides this, but the programmer can also specify a memory area for portions of a program (e.g., chip RAM for graphics and sound). MetaScope displays the hunks in order of starting address; select one by pointing and clicking with the left button.

Symbol Windows display currently defined symbols in either address or alphabetical order. While you can select the symbol value or name with the mouse, you cannot modify it from this window. From the Input Windows, MetaScope will ask you to enter information necessary to complete some task you have asked it to do.

As with many monitors, you can enter small assembly code segments directly, bypassing the need for an assembler. You can use it to search the Amiga's memory for a code or data sequence, fill an area with any value, or modify the contents of memory.

The program is mouse driven, and each type of window comes with its own set of menus. In addition, the many keyboard commands allow you to set breakpoints, resume execution of a program, begin single step trace execution or even continuous trace execution.

MetaScope is a very powerful tool and has about everything you could ask for in a debugging monitor. It is not for the lighthearted programmer, however, as even the most advanced C programmer will find it useless if he does not have a solid knowledge of 68000 assembly programming.

Given that the Amiga's native language is C, the number of C programming aids available is comforting. With the exception of animation and sound routines, Intuition is fairly well represented, and you can find packages that make data manipulation easier (Key To C). If you want to write your own code, Lint and MetaScope will debug it for you. For those who have trouble remembering commands, several good reference books are on the market. Whether you're looking for a shortcut to save time or don't care to learn a series of complex calls, you're sure to find a utility that will help. ■

Louis R. Wallace is a Contributing Editor to AmigaWorld. *David Darus is a mainframe database programmer and frequently writes for several computer publications. Write to them c/o* AmigaWorld *Editorial.*

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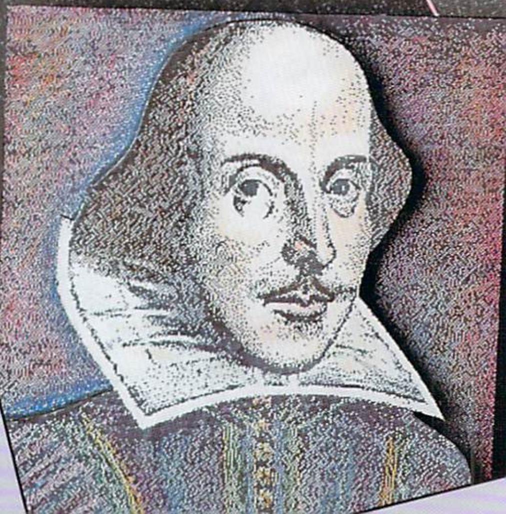
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Low-Down Programming: Amiga Assembly Language

Create a simplified environment for your Amiga assembly-language efforts and learn how to access Amiga libraries from assembly code.

By Bryce Nesbitt

Everyone knows the advantages and disadvantages of writing programs for the Amiga in 68000 Assembly Language: such programs are much more efficient than programs developed with high-level languages such as C and Amiga Basic, but they are also harder to write. And, the Amiga Assembly-Language environment is not the easiest for a programmer to work in.

This article will help you approach the challenging but rewarding task of learning to program the Amiga in assembly language. I don't intend to teach you 68000 Assembly Language—that's a chore beyond the scope of a single magazine article. However, I will show you how to create a programming environment to make assembly programming easier, give you a sample program to get you started and pass on a number of tips and rules on assembly-language programming that I've gleaned from my experience with the Amiga.

Tools Required for Assembly

A good assembly environment consists of more than a text editor and an assembler, although, of course, either the Commodore-Amiga/Metacomco assembler or the new Metacomco Macro Assembler is a prerequisite for any Amiga assembly work. On the hardware side, you'll need at least 512K RAM. Two disk drives are also highly recommended, although I outline how to create a combination Workbench/Assembler disk in the accompanying sidebar, Using the Assembler with One Drive (page 35).

In addition, you can't do a lot of assembly work without a working knowledge of the CLI and a good text editor. (See the product information box for a listing of Amiga text editors.) Finally, you'll need a good reference book on 68000 Assembly Programing and a set of Amiga manuals including the *ROM Kernel Manuals* (Addison Wesley) and *The AmigaDOS Manual* (Bantam). You should also check out some of the third-party Amiga books that aren't devoted exclusively to C programming. Eugene P. Mortimore's *Amiga Programmer's Handbook* (Sybex) is a good example of a book that is helpful to both C and assembly programmers.

Keeping it Simple

Computers are great for performing tasks that you and I consider tedious and repetitive. A good example of this is specifying all the parameters the Amiga assembler needs in order to do its job of turning your assembly code into Amiga machine code. To keep the assembly process simple, I developed the following short AmigaDOS execute file. To use the file, simply enter it with any Amiga text editor and save it to the "S:" directory on your workbench disk. Then, when you want to assemble a source-code file, execute this file from the CLI with the source code as the only parameter. The file does the rest. Here it is, with a step-by-step description:

```
.bra {
.key file
.ket }
assem-devel:c/assem {file}.asm  – i assem-devel:include
   – o ram:{file}.o
assem-devel:c/alink {file}.o lib assem-devel:lib/amiga.lib
   to {file}
delete ram:#?.o
```

The first three lines define parameter substitution. Whenever the string {file} is encountered in the contents of the execute file, it is replaced with the first parameter you type after the name of the execute file. For example, if you call the execute file easy and you ►

want to assemble a source-code file called mygame.asm, you'd enter the following from the CLI:

execute easy mygame

The name mygame would then be used wherever the execute file encountered the sequence {file}.

Line four of the execute file calls the assembler. From the left, the assembler gets the name of the file to assemble (with the .asm extension tacked on), the name of the directory containing the include files, and the location where the assembler will store the temporary object module (with the extension "o" appended to the original file name).

The next line invokes the Amiga linker. The linker takes the object file and turns it into an executable module. The final line gets rid of the now useless object file.

Easy Startup

To speed up the assembly process even more, you can set up your system so that all working files reside on a RAM disk. The easiest way to do this is to edit the startup-sequence of your boot disk. The first thing you should do is remove the line that reads endcli >nil: from the startup-sequence since you'll do most of your assembly work from the CLI. You can also delete the LoadWB command if you wish. After making the above

```
Listing 1. Parrot.asm
=====================

 ;***************************
        NOLIST
        INCLUDE 'exec/types.i'
        LIST
jsrlib  MACRO
        XREF     _LVO\1
        jsr      _LVO\1(a6)
        ENDM
 ;***************************
        move.l   a0,d2
        move.l   d0,d3
        moveq    #20,d7  ;RETURN_FAIL
        move.l   4,a6    ;_AbsExecBase
        moveq    #0,d0
        lea      dosname(pc),a1
        jsrlib   OpenLibrary
        tst.l    d0
        beq.s    e_dos
        move.l   d0,a6
        jsrlib   Output
        move.l   d0,d1
        beq.s    e_error
        jsrlib   Write
        cmp.l    d0,d3
        bne.s    e_error
        moveq    #0,d7    ;RETURN_OK
e_error move.l   a6,a1
        move.l   4,a6     ;_AbsExecBase
        jsrlib   CloseLibrary
e_dos   move.l   d7,d0
        rts

dosname dc.b     'dos.library',0
        END
```

Using the Assembler with One Drive

IT IS POSSIBLE, contrary to popular belief, to use the 68000 assembler with only one drive. It just requires some extra set-up the first time around. Using a copy of the assembler disk (which is assumed to be named *assem-devel:*) and a Workbench disk, perform the following CLI commands:

CD RAM:
INSTALL ?
(Insert the assem-devel: disk and type DF0:. When the light goes out, replace Workbench.)
MAKEDIR L
MAKEDIR DEVS
MAKEDIR DEVS/PRINTERS
MAKEDIR LIBS
MAKEDIR FONTS
COPY L: TO RAM:L ALL
COPY LIBS: TO RAM:LIBS ALL
COPY DEVS:#? TO RAM:DEVS
(Modify the next line to reflect the name of the printer driver you intend to use.)
COPY DEVS:PRINTERS/*EPSON* TO RAM:DEVS/PRINTERS
DELETE DEVS/NARRATOR.DEVICE
DELETE LIBS/TRANSLATOR.LIBRARY
DELETE ASSEM-DEVEL:S/#?
COPY RAM: TO ASSEM-DEVEL: ALL
COPY S:STARTUP-SEQUENCE TO RAM:T
COPY T TO ASSEM-DEVEL:S/STARTUP-SEQUENCE
DELETE RAM:#? ALL
COPY C:COPY TO RAM:
COPY SYS:PREFERENCES TO RAM:

Now copy the commands you plan to use from the C: directory into the RAM disk. All of the commands won't fit, so you will need to be selective. Here is a suggested subset:

Assign
CD
Copy
Date
Delete
Dir
Path
Echo
Ed
Endcli
Execute (x)
Failat
Fault
Info
List
Makedir
Newcli
Rename
Run
Stack
Type
Why
X (execute)

If you can manufacture some more space, you may also want the following:

Diskcopy
Filenote
Format
Loadwb
Protect
Status

When all the desired commands are in the RAM disk, finish off with the following command lines:

COPY RAM:#? TO ASSEM-DEVEL:C
DELETE RAM:#? ALL

With a disk prepared as above, the assembler can be used in the same manner as if a two-drive system were in use.☐

---

deletions, add the following lines to the startup-sequence:

```
cd ram:
path ram:t
copy c:copy to ram:
copy c:execute ram:x
copy c:list ram:
copy c:dir ram:
newcli "con:0/1/640/100/Old CLI"
```

These commands set the RAM disk as the current directory, and copy often-used commands to the RAM disk to make life easier. You can add other commands you use to this list. The last line creates a second CLI window. Note that I rename the execute command "x" when I copy it. This saves wear and tear on the fingers.

Following the Example

Once you've customized your assembly work environment, you can start exploring the wonderful world of Amiga assembly-language programming. To start you on your way, I've included a sample program called Parrot (Listing 1) that you can enter and assemble. The program reads whatever you type into the CLI and echoes it back to the screen. Although short and simple, it demonstrates the basic concepts needed to get a

program up and running from the CLI. Refer to the listing to follow the detailed explanation that follows.

Line 1 of the listing is a comment line. Lines 2 through 4 demonstrate an INCLUDE directive and the LIST/NOLIST directives. The INCLUDE directive gets the external file types.i and uses it as an extension of the source. Many files intended for programmer use are located on the assembler disk. To see them, examine the assem-devel:include directory. These files contain system constants, standard names and the data structures that make the Amiga tick. This INCLUDE directive is intended as an example; the types.i file isn't actually used. The LIST and NOLIST directives control what parts of your source will appear in the optional listing file you can create at assembly time.

Lines 5 through 8 define a macro called jsrlib. This macro makes the syntax of system calls easier. When the macro is expanded the \1 is replaced with the first parameter typed after the macro name:

As typed in source:
jsrlib UnLock

As assembled:
xref _LVOUnLock
jsr _LVOUnLock(a6)

The xref tells the assembler that the label _LVOUnLock is defined external to the source. The jsr actually performs the system call.

The CLI starts execution of the program at line 10. On entry, the registers are as follows:

Register	*Description*
A0	pointer to typed line
D0	Length of typed line

D0 will always have a minimum value of 1 since the CLI appends a linefeed. These values are moved (lines 10 and 11) to safer registers for later use.

When a program exits it must pass a return code back to the CLI indicating its status. Line 12 sets up a default code of 20, indicating total failure. If the program executes successfully, the return code changes to 0. Here's a list of the return codes:

Name	*#*	*Description*
RETURN_FAIL	20	Severe failure (no memory, no DOS, etc.)
RETURN_ERROR	10	Error, less serious than fail (syntax, etc.)
RETURN_WARN	5	Just a warning
RETURN_OK	0	No problem here

Using a Kernel Routine

Lines 13–19 open the DOS library for use by the program. This library is just one of many available libraries

Rules and Regulations

ON THE MULTITASKING Amiga, any single task may be sharing an executing environment with many others. This dictates that certain rules and conventions be followed. Following the rules below will save you a world of trouble.

Programming Practices

- The Amiga system does not control resources. If a file is opened, it must later be closed. If memory is allocated, it must later be de-allocated. Most operations have corresponding "un-operations" that must be performed before exiting.
- *Always* check the error returns of system functions. A task must not, for example, assume that an attempt to allocate memory will always succeed. Many tasks may be competing for the same resources you are. If they win, action must be taken to resolve things or to gracefully give up and exit. Error and resource handling are two of the most important things to watch out for.

System-wide Conventions and Requirements

- Registers D0, D1, A0 and A1 are scratch registers. Any Amiga function or ROM call is free to use these without saving the contents first. Function parameters to system calls are passed in registers. Parameters passed in D0, D1, A0 or A1 may be destroyed by the routine; all other registers will be preserved. A user program can, of course, utilize all registers.
- Some library routines use A6 as an offset to local data structures. It is important that A6 hold a proper library base pointer at the time of the call.
- Any data that is intended for the graphics chips or other custom hardware must be specifically allocated as Chip memory. Static data that is part of a program must be directed to the proper area with the atom or fixhunt utilities. Failure to do this will result in improper operation on an Amiga with expanded memory.
- Do not use absolute addresses. All hardware registers, system routines and special addresses have symbolic names, derived addresses and defined access procedures. Failure to use these will result in incompatibility with future Amiga models and conflict with other tasks that share the same environment.
- For compatibility with the 68010 and 68020 processors, avoid the use of the MOVE SR,<ea> instruction. Use the exec GetCC( ) function if you need to examine the processor condition codes.
- For compatibility with future Amiga models, all address pointers must be 32-bits in size, not 24. The upper byte of an address may never be used for data.☐

of callable routines that you can access from your programs. Each library contains a collection of related routines. The table below contains a partial list:

Library	**Description**
exec.library	system, processor and task control
dos.library	disk, CLI and file system calls
intution.library	graphics user interface; windows and menus
graphics.library	direct graphics primatives; used by Intuition
layers.library	clipping and layering of rectangular regions
diskfont.library	handles disk-based fonts
icon.libraries	icon-handling tools
(math libraries)	different style floating-point math routines

To call a library routine, you need two things: a base pointer to the library and an offset. A call to the exec OpenLibrary routine gets you a base pointer, while the system derives the offset from the name of the routine. In the example I used to describe my macro definition, _LVOUnLock is the name of the routine and A6 is the location of the library base pointer.

OpenLibrary is a routine found in the exec library. You may wonder how you can use it and other exec routines, since you can't use OpenLibrary to get the exec base pointer without the exec base pointer. To avoid this classic "chicken-or-the-egg" problem, Commodore-Amiga defined address location 4 as the pointer to the exec library. Called _AbsExecBase, this is the only absolute software address in the Amiga system. Line 13 moves the contents of this location into A6 in preparation for a call to OpenLibrary.

Here is a close look at the registers used by the OpenLibrary routine:

library = OpenLibrary(	libname,	version)
D0	A1	D0

You pass parameters to OpenLibrary in address register A1 and data register A0. OpenLibrary returns the base pointer to the library in data register D0. This is the number you *must* have in address register 6 whenever you access a routine in that particular library.

Back to our listing. Line 14 moves zero into D0, indicating that any version of the library will do. The LEA (Load Effective Address) instruction in line 15 is used to indirectly derive the location of the label dosname. The OpenLibrary call will search for the library with a name identical to the zero-terminated string on line 33.

Having set up the parameters, line 16 calls OpenLibrary. Lines 17 and 18 check the results of the call. If D0, where OpenLibrary stores its results, is zero, then the call didn't work. In this case, a branch is made to the label e_dos. Otherwise, the value in D0 is assumed to be the base pointer for the DOS library.

Line 19 moves the validated pointer into A6, readying the system for calls to the DOS library. Normally, base pointers for various libraries are stored in memory locations and moved to A6 as necessary. Since so few libraries are used in this example, there is no need to store the base pointers.

The DOS routine Output called in line 20 takes no parameters. It returns a file handle to the current output stream in D0. Normally, the file handle points to the console window. If output redirection is used, however, it could point to a disk file. Lines 21 and 22 move the results into D1 and check for zero, which indicates an error and causes a jump to the e_error label.

If the call to Output returns a valid result, the program calls the DOS Write routine. The Write routine uses the following registers:

Tricks, Traps and Pitfalls

THE FOLLOWING ARE more valuable, handy things to know: relevant facts about what's what, things you should do and things to look out for:

- Most 68000 instructions can operate on byte, word or long-word quantities. For predictable and readable results, the length of each instruction should be specified with a .B, .W or .L suffix. For data register operations of byte or word length, keep in mind that only the lower quarter or half of the register will be affected.
- Conditional tests can be confusing. The table below shows which branch instruction to use after a CMP D0,D1 instruction.

Desired Test	*Signed Numbers*	*Unsigned Numbers*
D1>D0	BGT	BHI
D1>=D0	BGE	BCC (BHS)
D1=D0	...	BEQ
D1<>D0	...	BNE
D1<=D0	BLE	BLS
D1<D0	BLT	BCS (BLO)

- A loop ending with a DBcc instruction will loop until either a counter has expired or a condition is met. A DBEQ (decrement and conditionally branch until equal) instruction will loop until the condition codes indicate equality. This can be confusing since an equivalent sequence of instructions would require a BNE (branch not equal) to continue the loop.
- When an address register is specified as a destination for an instruction, the processor condition codes will not be affected. Thus a MOVE A0,D0 will affect the codes while MOVE D0,A0 will not.
- Data structures relating to the DOS portion of the operating system often contain BPTR fields. (A BPTR is a type of pointer used by the language BCPL and points to a longword address.) To convert this to something useful it must be multiplied by four. If the BPTR is in an address register, the best way to do this is with two ADDA.L An,An instructions.
- All system routines follow a standard capitalization convention, with the first letter of each word component capitalized (e.g. *FileInfoBlock* and *Write*).
- A brief (very brief) summary of the available libraries and routines—as well as their syntax—can be found in the .fd files directory. To examine these you could type DIR ASSEM-DEVEL:FD.FILES OPT I.□

Product Information

ASSEMBLERS:
Amiga Macro Assembler
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
215/431-9100
$99.95

Macro Assembler
Metacomco
26 Portland Square
Bristol, BS2 8RZ, England

REFERENCES:
68000 Assembly Language
Amiga ROM Kernel Reference Manuals (2 vols.)
1) Exec 2) Libraries and Devices
Amiga Intuition Reference Manual
Addison-Wesley Publishing Co. Inc.
Reading, MA

MC68000 16/32-bit Microprocessor Programmer's Reference Manual
Prentice-Hall
Englewood Cliffs, NJ

Amiga Programmer's Handbook
Sybex
Berkeley, CA

The AmigaDOS Manual, 2nd edition
Bantam Books
New York, NY

TEXT EDITORS:
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Many versions of Emacs and other text editors are available at minimal cost from Amiga public domain sources.

```
ReturnedLength = Write  (File,  Buffer,  Length)
D0                       D1      D2       D3
```

The Write routine expects to find a file handle from an Open or Output statement in D1 (line 21). D2 must contain a pointer to the data (line 10), while D3 must have the length of the data to be written (line 11). When the Write routine returns, it places the length of the data actually written into D0. Like all returns, you must check it to see that it contains what you expected. Line 24 compares D0 with D3, which still contains the length of the requested write data. If D0 equals D3, then the call was successful and the program falls through the branch at line 25 and places the RETURN_OK value into D7. If there is a problem, line 26 is skipped and the RETURN_FAIL set up in line 12 remains.

In either event, you have to close the library you opened. This is set up in lines 27 and 28, where the DOS base pointer is moved into A1 and the exec base pointer goes into A6. The program then calls the CloseLibrary routine, which takes a single parameter in A1, the library base pointer of the library being closed. No error return is possible or checked for.

Line 30 moves the return code out of its hiding place in D7 and into D0. The RTS then returns control back to DOS.

Putting It Together

Once you've entered the program and saved the source file as parrot.asm, assemble it with the command:

```
x easy parrot
```

If the assembler reports errors, correct them and try again. When you get a successful assembly, send up an offering to the deity of your choice and type:

```
parrot "gibberish"
```

You should be rewarded with "gibberish" on the next line. You're now an Amiga 68000 Assembly Language programmer!■

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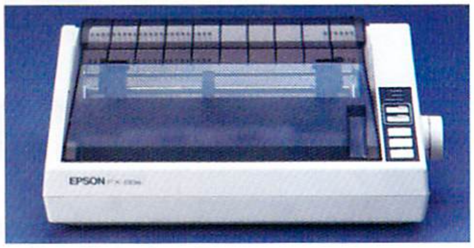
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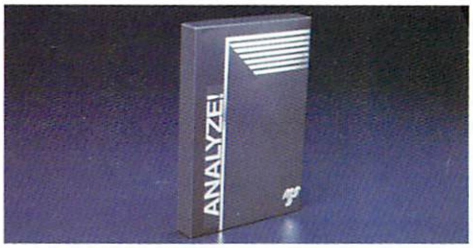


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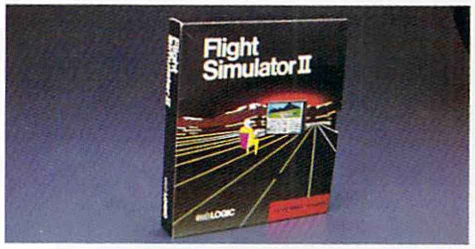
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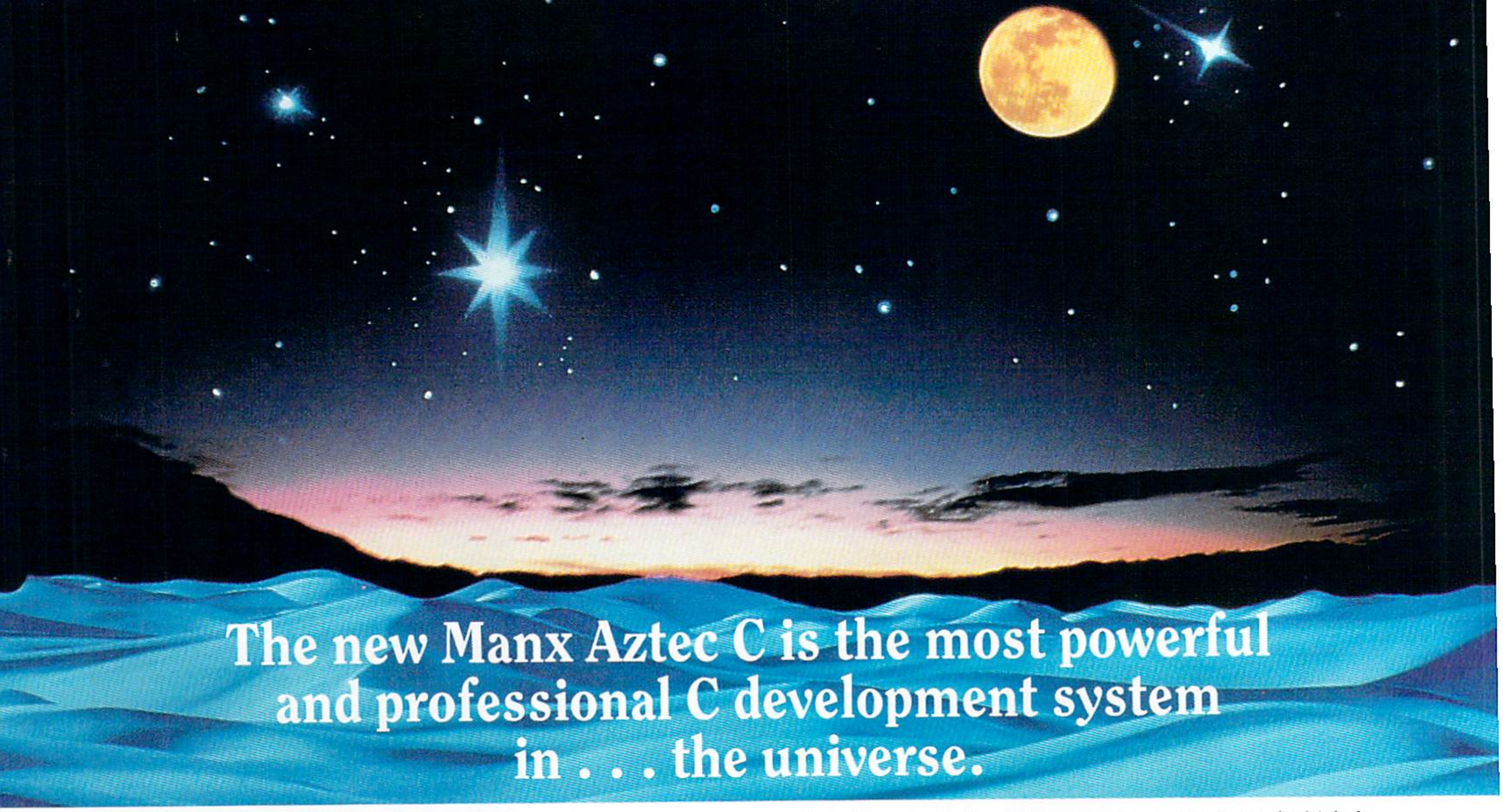
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Dynamic Memory Allocation in BASIC: Creating Linked Lists

Give your Amiga Basic programs the power of compound data types and dynamic memory allocation found in C.

By Donald Horner, Ph.D.

One of the constraints of BASIC is its shortage of built-in data structures—particularly compound data types. Compound data types allow you to access groups of variables of different types (integer, real, string) as if they were a single variable. BASIC lacks the flexibility offered by Pascal and Modula-2 with their *records*, and C with its *structures*. Also absent from BASIC is the dynamic memory allocation associated with data structures that use compound data types. Dynamic memory allocation is the process whereby memory is allocated to structures only as needed.

In this article, I describe a way to use random access files to simulate compound data types and dynamic memory allocation in BASIC. Random access files make the simulation possible, and the speed of the RAM disk makes it practical.

Compound data types store a mixed bag of data items as if they were a single entity with a single name. This is done automatically, as far as the user is concerned. Professional BASIC programmers long ago learned to "mask" strings to accomplish the same result (unfortunately, in a non-automatic way). The record of BASIC's random access files has this same property.

Each record from a random-access file is a string of predetermined length. The Field statement is the mask, or template, that partitions each record into substrings and gives a (string) variable name to each. By using CV*() instructions, you can convert substrings to the appropriate variable type. Conversely, the use of MK*$() instructions allow you to convert from numeric data back to strings. You use these strings to construct compound data types (string) from the individual data components. The composite structure is stored in the file buffer.

Having to read from and write to a disk with every reference to one of these data types is slow and cumbersome. The RAM disk speeds things up appreciably.

An Example

Consider the following example of a composite data entity:

```
| emp.name$ | emp.years% | emp.payRate | emp.ssn$
  | emp.deptNo% |
```

The structure consists of five pieces of data: two strings, two integers and one single-precision real number. As a unit they might constitute a company's personnel data structure in RAM or a personnel record in a file. In this case, the number of instances of this structure would depend on the number of employees; the information in each structure would be subject to query and update. ►

Suppose you wished to process a list of these personnel data structures just described. How would you store them in a BASIC program? One choice is to use BASIC's only compound data structure—the array. However, two problems exist: 1) Arrays are homogeneous (i.e., all entries are of the same simple data type); 2) Arrays are of a fixed size declared in DIM statements.

Two techniques are widely used to handle the first problem. In the first method, one array is used for each piece of data in the structure. The second method involves using an array of strings and masking the strings as described earlier.

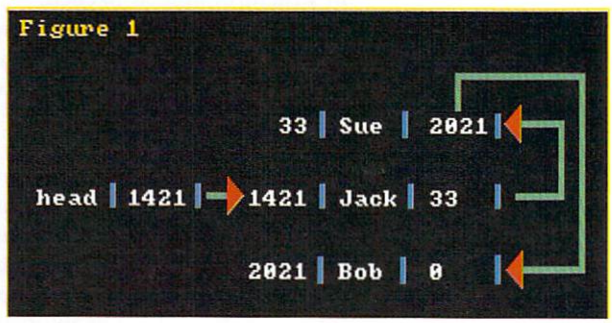
The problem of fixed size is normally solved by declaring arrays to be at least as large as the greatest number of expected entries. This is usually satisfactory (if the combined "worst cases" don't overload the available memory). However, dynamic memory allocation and linked lists offer an alternative.

Linked Lists

A linked list is a simple structure. Each element has a position number. If the list is not empty, the element in position number one is the first element, the next in line is number two, followed by number three and so on through the last element (the one with the highest position number).

The form of the elements is interesting. Each element has a *data* part and a *link* part. The data part holds the information you wish to store (such as the five-part structure above), while the link part holds information about the location of other elements in the list (normally the next element in the list and, perhaps, the preceding element). The use of extra storage for the links (or pointers) allows the programmer to store the list data at random since any data value can be found by "following the arrows." The two-part elements are generally known as *nodes.*

Figure 1 and Table 1 are examples of *singly* linked lists; each link part has only one pointer, which locates



the next node in the list. Figure 1 shows a linked list of three nodes. The *head* is not part of the list itself but merely tells you where the first node is to be found. (It's not easy to follow the arrows until you know where to find the first one.) The first node is located at address 1421 and has value *Jack.* The link of this first node points to address 33, where you find the second node with data value *Sue* and pointer value 2021. As

you have already seen, node number 3 at address 2021 has value *Bob* for data and zero for the link. A zero link value is called the *nil* pointer, a pointer pointing to nothing. In our case, it means that the third node is the last node in the list.

List Operations

In order for you to use and manage linked lists, it is necessary to know what operations will be performed. Table 1 gives the specifications for a reasonable set of such operations. A non-empty linked list—at any point in time—will always have one element designated as the active, or *cursor*, node. All action takes place relative to that element. Operations allow you to know the position of the cursor in the list and the size of the list. You are able to read or overwrite (update) the data portion of the cursor node, and you can completely clear a list if you wish. Cursor-node selection (cursor movement) is done by selecting the first node or the next node following the present cursor. You can insert nodes before (in front of) the cursor node or at the end of the list. The cursor node may be deleted.

Random File Use

If you want to make a linked list using random access files, each list node will be a record in the file. It is necessary to know which record numbers are associated with which data elements. This is where linking comes into play.

Whenever a node is required, an unused record number will be assigned. If you conceive of a record as a chunk of available memory, this activity simulates the dynamic allocation of memory for the storage of one of the complex data units. All storage and retrieval is by record number. Each "chunk," or record, in a random file is of the same length (up to 32,767 bytes). Record numbers can be allocated in the range from 1 to 16,777,215. Think of record numbers as addresses for the link pointers. In the case of our previous personnel structure example, the mask or template would look like this:

| N$ | Y$ | P$ | S$ | D$ | L$ |

The correspondence with the earlier example goes like this:

N$ = emp.name$ . . . . S$ = emp.ssn$
Y$ = emp.years% . . . . D$ = emp.deptNo%
P$ = emp.payRate . . . . L$ = ptrNext

The new entry is L$ and represents the link value pointing to the next node in the list.

An Implementation

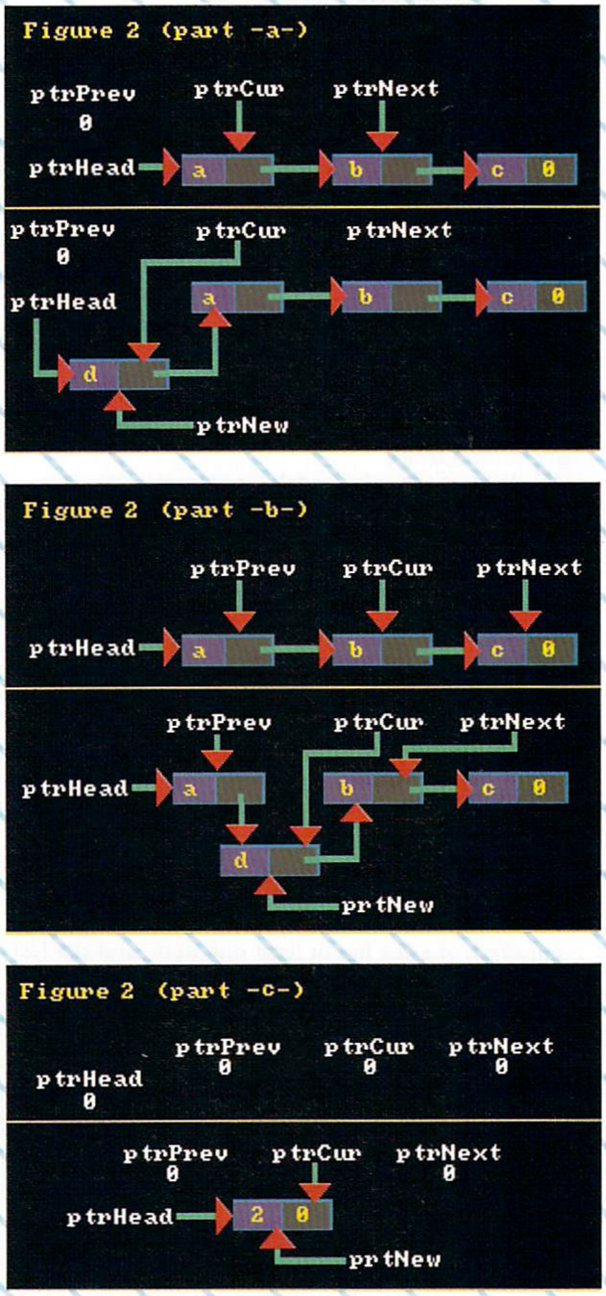
Listing 1 shows one way to implement this particular list. Only some of the operations require explanation. Node insertion and node deletion are the most complicated operations. All the operations are packaged together using the subprogram facility of Amiga Basic. ►

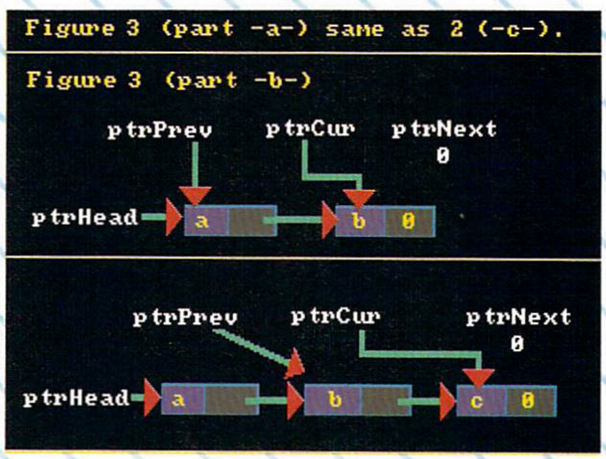
Table 1. Functional Specification—(singly) linked list.

Elements: nodes of two parts. 1) user-defined data part; 2) link to next node.

Structure: linear with each element having a position number. If the list is non-empty, one node is designated as the *cursor* node.

Operations:
l.list(size,*result*)
  action: returns the number of nodes as *result*.
l.list(position,*result*)
  required: the list has at least one node.
  action: returns the position number of the cursor node as *result*.
l.list(clear,*result*)
  action: all nodes are removed from the list.
l.list(readElt,*result*)
  required: the list has at least one node.
  action: the cursor node's data value is returned in the appropriate global variable.
l.list(writeElt,*result*)
  required: the list has at least one node and the value to be written is in the appropriate global variable.
  action: The data value of the cursor node is overwritten with the global variable's value.
l.list(goNext,*result*)
  required: the list has at least one node and the last node is not the cursor.
  action: the node following the cursor becomes the cursor node.
l.list(goFirst,*result*)
  required: the list has at least one node.
  action: the first node becomes the new cursor node.
l.list(putBefore,*result*)
  required: the global variable holds the data for a new node.
  action: if the list was empty, a new node with the global variable values as data part becomes the list's only node and the cursor node. Otherwise, the new node is inserted in a position just before the cursor: the new node becomes the cursor.
l.list(putEnd,*result*)
  required: the data part of the new node is to be in the global variable.
  action: a new node with data part equal to the global variable value becomes the last node in the list and the cursor as well.
l.list(remove,*result*)
  required: the list must contain at least one node.
  action: the cursor node is removed from the list and the node in the following position becomes the new cursor. If the cursor were the last node, however, the first element (if any) becomes the new cursor.





To avoid passing a load of parameters to the subprogram *l.list*, SHARED variables are used for the five data components of the personnel record. Initialization takes care of opening the RAM: file that will act as our reservoir of assignable memory chunks. The Field statement does the masking. The two parameters for a call to *l.list* tell the name of the operation being invoked and allow for a return message where appropriate.

A general word: Any variable starting with *ptr* is a pointer value (integer here since the list will be no longer than 32,767 nodes). Several pointers may need explanation:

ptrCur points to the cursor.
ptrPrev points to the node whose position is one less than the cursor.
ptrNext points to the node that follows the cursor.
ptrHead points to the first node in the list.
ptrAvail points to the next record number to be allocated upon request.
ptrNew points to the newly allocated node.

The cursor node's record is in the file buffer at the end of every call to *l.list* and, therefore, at the start of every call. Strictly speaking, this makes *ptrNext* unnecessary. Similarly, it can be argued that *ptrPrev* is unnecessary (even though it is a worthwhile convenience).

Pointers *ptrHead, ptrCur, ptrPrev* and *ptrNext* are zero when the list has no nodes. Additionally, *ptrPrev* equals zero when the first node is the cursor while *ptrNext* equals zero when the last node is the cursor.

Operations *size* and *position* are simple: Return the value of *sz%* or *psn*. This means that *sz%* must change with each insertion and deletion of a node, while *psn* must change with every cursor movement. Cursor movements may occur with insertions and deletions as well as with *goNext* and *goFirst*.

Invoking *goNext* requires moving *ptrCur* to the next node (indicated by *ptrNext*). It also requires moving *ptrPrev* and *ptrNext* ahead one node. Moreover, you must read the new cursor node into the file buffer.

In *goFirst* you see the cursor being set to the head and *ptrPrev* being set to zero. That is because there is no node preceding the first node. Again, the new cursor node must be read into the file buffer and *ptrNext* must be reset.

To *readElt*, simply put the buffer values into the shared variables. To *writeElt*, transfer the shared variable values into the file buffer and write to the RAM: file. The last operation requires the main program to have loaded all the emp. values before the call.

Jumping down to *clear*, observe that it simply closes the RAM: file, kills it and resets all local variables that make a difference. We jumped down to *clear* because the insert and delete operations are the most complicated.

Figure 2 indicates the two situations in which you may *putBefore*. You may try to insert a new node before the first node (part a) or before some other node (part b). Inserting before the head node also works when the list has no node previously entered (empty list as in

part c). The process is complex but straightforward in each case: Get a new node, set *ptrCur* to the new node, set the appropriate pointer (*ptrHead* or the link pointer of the previous node) to the new node, load the buffer with the new node's values and write the record. In the second case, changing the link value of the previous node requires rewriting that node to keep it updated. Of course, the size and position values must be updated.

The operation *putEnd* is similar. The two possible cases are an empty list and a non-empty list (see Figure 3). The empty case is easy: Reset the head and cursor to the new node, put a zero in the link field and write the record. The non-empty case is more difficult. You must advance the cursor to the last node, rewrite the last node with the new link value (pointing to the new node to be inserted), move the cursor to the new node, put a zero in the link field and the shared variable values in the buffer and write the record. Again, the position and size information must be updated. In all insertions and deletions, *ptrPrev* and *ptrNext* must be updated. To be successful, you must 1) change all values that require change, and 2) make the changes in a proper order.

The operation *remove* has four general cases (see Figure 4). You are removing the only element in the list, the first element, the last element or some other node. The cursor must end up as zero (removed the only node), pointing to the node following the removed node or pointing to the first node (removed the last node). These clues should enable you to follow the code.

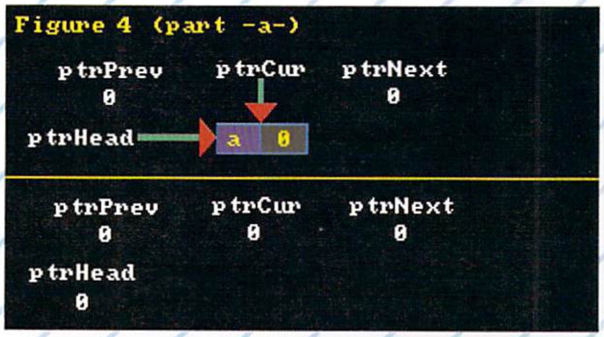
A Few Notes

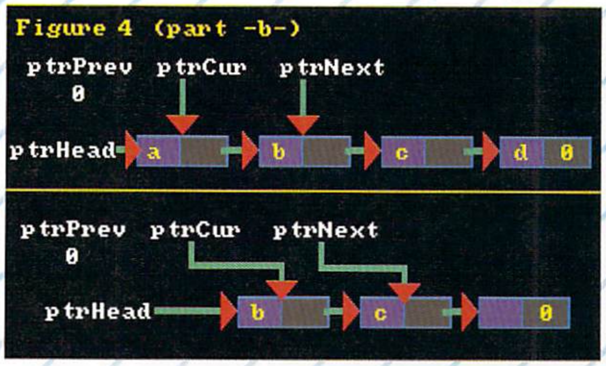
You can make my implementation much more efficient. The routine does not protect the calling program from violating the requirements for making each call. You could use *result%* to return a flag indicating success or failure for each of the operations other than *size* and *position*. That would require an added test for each operation to prevent executing it unadvisedly (e.g., no *remove* allowed if the list is empty, no *goNext* if the list is empty or if the cursor is the last node, and so on). You can improve the memory-allocation scheme by adding a deallocation process. Currently, a removed node's record number is not available for reuse. It is possible to maintain a linked list of available record numbers (probably in the form of a stack).

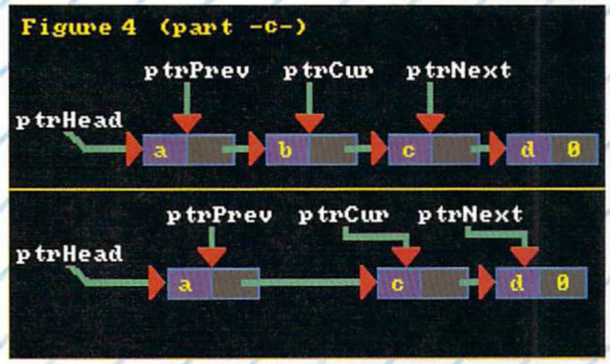
You might extend the linking so that the link field in the last node points to the first node rather than having the value zero. You also might consider making *ptrHead* a *ptrTail* in that case. Or, you might consider keeping two link values in the node—one pointing back to the previous node as well as the forward link pointing to the next node. That would do away with the need for *ptrPrev* and would allow *goBack* to be easily added to the implementation.

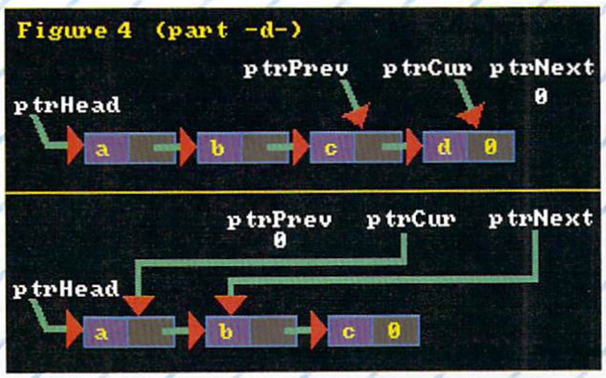
Conclusion

If you are willing to work at it a little, simulating dynamic memory allocation for a compound data structure is possible in BASIC. The subprogram of Amiga ►









Basic makes it easy to add such a routine to your library. One of the major uses of compound data structures is in constructing linked objects, particularly when the number of such objects is unknown during the programming exercise. The ability to use memory dynamically is achieved at the expense of more complex code (in some cases) and the requirement of using memory to carry the pointers or links. If your compound data units are accessed naturally by the value of certain data parts, linked structures such as linked lists may be the best approach. Anyway, you do have a choice. □

Dr. Donald Horner teaches computer science at Eastern Washington University. Write to him at Route 2, Box 54, Cheney, WA 99004.

Listing 1. *Subroutine for implementing linked lists in Amiga Basic.*

```
SUB l.list(operation$,result%) STATIC
  SHARED emp.name$,emp.years%,emp.payRate,emp.ssn$,emp.deptNo%
  DEFINT p
  IF firstime%=0 THEN                          'initialization
     OPEN "R",#1,"RAM:employee",29
     FIELD #1,10 AS N$,2 AS Y$,4 AS p$,9 AS S$,2 AS D$,2 AS L$
     ptrAvail=1
     firstime%=1
  END IF
  IF operation$="size" THEN
     result%=sz%
  ELSEIF operation$="position" THEN
     result%=psn
  ELSEIF operation$="goNext" THEN
     GOSUB advance
  ELSEIF operation$="goFirst" THEN
     ptrCur=ptrHead
     ptrPrev=0
     GET #1,ptrCur                     'read node's values
     ptrNext=CVI(L$)                   'and reset next pointer
     psn=1
  ELSEIF operation$="readElt" THEN
     GOSUB prepRead                    'transfer node's values
  ELSEIF operation$="writeElt" THEN
     GOSUB prepWrite                   'transfer values to buffer
     PUT #1,ptrCur                     'write node's values
  ELSEIF operation$="putBefore" THEN
     GOSUB getnode
     IF ptrCur=ptrHead THEN            'first node is cursor
        ptrHead=ptrNew                 'or list is empty
        psn=1
        RSET L$=MKI$(ptrCur)
     ELSE                              'cursor is not first node
        GET #1,ptrPrev                 'look at previous node
```

```
      RSET L$=MKI$(ptrNew)          'reset the link pointer
      PUT #1,ptrPrev                'and write
      RSET L$=MKI$(ptrCur)
   END IF
   ptrNext=ptrCur                   'pointer houskeeping
   ptrCur=ptrNew
   GOSUB prepWrite                  'fill file buffer
   PUT #1,ptrCur                    'write
   sz%=sz%+1
ELSEIF operation$="putEnd" THEN
   GOSUB getnode
   IF sz%=0 THEN                    'empty list
      ptrHead=ptrNew
    ELSE                              'for nonempty list
      FOR i%=1 TO sz%-psn             'move to last node
         GOSUB advance
      NEXT i%
      RSET L$=MKI$(ptrNew)          'reset last node's link
      PUT #1,ptrCur                 'and rewrite
    END IF
    ptrCur=ptrNew                   'pointer housekeeping
    ptrNext=0
    RSET L$="0"                     'set new node's link
    GOSUB prepWrite                 'fill buffers and
    PUT #1,ptrCur                   'write
    sz%=sz%+1
    psn=sz%
 ELSEIF operation$="remove" THEN
    IF ptrPrev=0 THEN               'remove first node
       ptrHead=ptrNext
       ptrCur=ptrHead
       IF ptrCur=0 THEN psn=0
    ELSE                            'not the first node
       GET #1,ptrPrev               'adjust previous node's
       RSET L$=MKI$(ptrNext)        'link
       PUT #1,ptrPrev               'and rewrite
       IF ptrNext=0 THEN            'if last node
          ptrCur=ptrHead            'move cursor to front
       ELSE                         'else advance cursor
          ptrCur=ptrNext
       END IF
       GET #1,ptrCur                'retrieve new cursor data
       ptrNext=CVI(L$)              'and reset next pointer
    END IF
    sz%=sz%-1
 ELSEIF operation$="clear" THEN
    CLOSE #1
    KILL "RAM:employee"             'reset important values
    ptrHead=0:ptrCur=0:ptrPrev=0:ptrNext=0
    ptrAvail=1:firstime%=0
    sz%=0:psn=0
 END IF
 EXIT SUB
 getnode:
    ptrNew=ptrAvail:ptrAvail=ptrAvail+1:RETURN
 advance:
    ptrPrev=ptrCur:ptrCur=ptrNext:psn=psn+1
    GET #1,ptrCur                      'get new cursor data
    ptrNext=CVI(L$)
    RETURN
 prepWrite:
    RSET N$=emp.name$
    RSET Y$=MKI$(emp.years%)
    RSET p$=MKS$(emp.payRate)
    RSET S$=emp.ssn$
    RSET D$=MKI$(emp.deptNo%)
    RETURN
 prepRead:
    emp.name$=N$
    emp.years%=CVI(Y$)
    emp.payRate=CVS(p$)
    emp.ssn$=S$
    emp.deptNo%=CVI(D$)
    RETURN
END SUB
```



USTRATED BY SANDRA FILIPUCCI

Kissing the Guru Goodbye

Here are five basic rules that will make for more well-mannered C programs, and fewer visits from the dreaded Guru.

By Mark L. Van Name and William B. Catchings

On most microcomputers, a program can act as if it has the machine all to itself. Within the limits of the machine—such as the amount of available memory—the program can use what it needs. The Amiga is different. Because of its multitasking ability, it doesn't permit programs to be so cavalier with the system's resources. Programs running on the Amiga must assume that other programs are executing also, and must share the resources accordingly.

Although the *AmigaDOS Developer's Manual* and the *ROM Kernel Manual* explain how programs should operate in a multitasking environment, the information is scattered around. This article contains five basic rules to follow as you program in C on the Amiga; it will help you put the manuals' scattered information in perspective, and will provide the developer of Amiga software with a sound framework within which to work.

1. DO NOT TIE UP SYSTEM RESOURCES UNLESS ABSOLUTELY NECESSARY.

Any resource controlled by one program is unavailable to others. Two of the most commonly abused resources are memory and the printer. Other less visible resources, such as file locks, also can cause you problems if you do not manage them properly. Unnecessarily holding a write lock on a file will prevent other programs from using the file.

Many microcomputers allow direct access to hardware components, such as printer ports and video-display memory. While such accesses also are possible on the Amiga, they should be avoided. AmigaDOS and the ROM Kernel provide functions that implement protocols for sharing all major hardware resources. Well-behaved programs should use these functions when they require hardware services.

2. BE SURE THAT YOU RECEIVE EACH RESOURCE YOU REQUEST.

This rule ultimately is enforced by the system. If a program fails to get a requested resource, such as memory, but uses it, a visit from the Guru is usually imminent. You should verify the success of all resource requests, no matter how sure-fire they may seem. This includes calls to obtain file handles, file locks, memory, screens, windows, libraries and so on.

One major resource that causes problems for many programs is stack space. Because the system doesn't attempt to verify that there is enough stack to run each program, the program should. A simple answer is a startup-sequence that sets the stack to the desired size and checks, of course, for the success of that request.

Many programmers forget they need chip memory, and often end up with blotchy displays or poor sound. The basic rule is simple: Any data that must be directly accessed by any of the three custom chips must be in chip memory. For example, BOBs, sprites, bit maps and sound samples all must be in chip memory. Note that this is not required for the data structures that describe those objects, just for the objects themselves. ►

The easiest solution is to store all such objects and the routines that manipulate them in one or more separate object files. Then you can use the Atom utility to mark these objects for loading into chip memory. If you do not follow this procedure, the default is to load objects into fast memory if any is available.

Though somewhat wasteful, another alternative is to copy such structures from fast memory into chip memory, which you expressly allocate once your program is running. Some newer compilers are offering a third alternative: the ability to mark an object, in the source code that defines it, as requiring chip memory.

A final, almost hidden type of resource is the ability to execute desired system functions. Amiga programs can spawn both separate tasks and separate processes. While these two may seem the same, they are not: A process is a superset of a task. Some functions can be performed only by processes. The basic rule is that a task can perform any function described in the *ROM Kernel Manual,* but cannot use any AmigaDOS function or any disk-resident library code. To access any AmigaDOS function, notably I/O support procedures, you must use a process. This restriction applies because some AmigaDOS routines need access to the information in the process control block of the entity that called them. You can use different methods to get around this, but it is generally unwise and can require a great deal of work.

Once a resource is requested and verified it should be locked down. While some resources are locked implicitly by their allocation, others must be explicitly locked. Failure to do so can allow another program to grab the same resource, leaving the first program open to a Guru Meditation.

Figure 1. AmigaDOS resource management pairs and ROM Kernel function pairs.

RESOURCE MANAGEMENT PAIRS:

Lock( )	UnLock( )
LoadSeg( )	UnLoadSeg()
Open( )	Close( )

ROM KERNEL FUNCTION PAIRS:

AllocSignal( )	FreeSignal( )
AllocMem( )	FreeMem( )

[Note: for memory management you also can use AllocEntry( ) and FreeEntry( ), or AllocMem( ) followed by Allocate( ) and Deallocate( )]

OpenLibrary( )	CloseLibrary( )
OpenDevice( )	CloseDevice( )
GetColorMap( )	FreeColorMap( )
AllocRaster( )	FreeRaster( )
GetSprite( )	FreeSprite( )
ADCMD_ALLOCATE( )	ADCMD_FREE( ) (for audio channels)
GetDiskObject( )	FreeDiskObject( )
AllocTrap( )	FreeTrap( )

3. FREE ALL RESOURCES WHEN YOUR PROGRAM TERMINATES.

Some programs stop with resources still locked or allocated, leaving the resources unavailable to other programs. Well-behaved programs should release their resources in the event of either normal or abnormal termination.

A common solution is to have a single program termination routine that is always called. This routine can free all resources, such as windows, memory and libraries, that were in use by the program. Usually, the pointer to the resource can be tested. If it is not 0, the resource is still in use and should be surrendered.

In some cases, the order in which resources are returned is important. For example, CloseWindow( ) frees the system gadgets attached to the window being closed. If your program has added any gadgets to the window, they either must be valid when you call CloseWindow( ) or you must first remove and deallocate them.

Resource management functions tend to come in the obvious pairs—one to obtain the resource and one to give it back. See Figure 1 for a list of some common AmigaDOS resource management pairs. Also in Figure 1 is a longer list of the more common ROM Kernel function pairs.

Related to memory allocation is a current memory management bug that could cause problems for some graphic programs. If a program does a ScrollRaster( ) either left or right in a SuperBitMap window, it will lose memory each time. To prevent this memory loss, the program must have its own TmpRas attached to the window. This loss occurs because the system is not deallocating the memory it uses for its internally created TmpRas.

4. NEVER TIE UP THE CPU UNNECESSARILY.

On single-user systems, many programs use a "busy wait" to pass the time until an expected event, such as user input, occurs. This is a very bad strategy on the Amiga, for the CPU could be doing other things while any one program is waiting. Rather than a busy wait, Amiga programs should use the Wait( ) function and wait for signals from all ongoing activities. When the program awakes it should check for messages at each port whose signal port was set. You should not forget that there may be more than one message per port. Also, you should ReplyMsg( ) to all messages that are not themselves replies.

5. DO NOT ASSUME ANYTHING THAT YOU CAN DETERMINE FROM THE SYSTEM.

Through such means as the Preferences tool, keymaps, multiple fonts and PAL support, the Amiga can support international users and a variety of basic options for each user. A program that assumes a particular country or user preference will not work where that assumption is invalid. In most cases, the system soft- ►

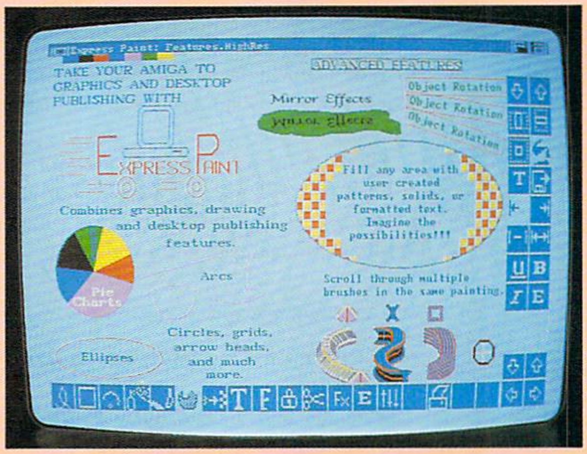
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Getting the Right Display Mode

MANY AMIGA programmers are not aware that the Interchange File Format (IFF) standard contains a provision to help them get the right view mode for stored images. Amiga images are stored in these IFF files primarily as ILBMs (Interleaved Bit Maps). The IFF specification calls for a data item, known as a CAMG chunk, to be stored with every ILBM.

The CAMG chunk is designed to contain the proper view mode for the stored image. Any time you write an ILBM you should set its CAMG chunk to indicate the display mode you would like others to use. Similarly, when you are displaying an existing image, you should check its CAMG chunk for the proper view mode.

This rule unfortunately is not followed by the sample code in the IFF specification. That code picks the view mode for its image by using the image's dimensions. While that strategy is the right one to use if there is no mode indicated by the image's CAMG chunk, programs always should check the CAMG chunk first.

Following rules such as this one clearly can be more work than just working according to our own rules. The reward, however, is a more consistent development environment; one where we can be sure that we will be seeing the images on our screens as their designers intended them to appear.

Fish, for Example

For an example of the proper way to use the information in the CAMG chunk, look at two programs on disk 64 in the Fred Fish series of Amiga public domain software. That disk contains a program that reads an ILBM and displays it, and one that captures the state of a screen and saves it, along with a CAMG chunk indicating the display mode, in an ILBM.□

---

ware offers ways for programs to avoid these limiting assumptions.

One of the more common assumptions is that the user has a particular font or character size, usually Topaz at 80 characters. Often this is not the case, as many users either have simple monitors or prefer the sixty-character display because of its larger characters. If your program needs a particular font or size, be sure to set it when the program starts.

The same is true for the screen's height (the number of lines). You can get this from the system constant STDSCREENHEIGHT. By using this constant instead of assuming a fixed size, your code will work correctly on systems that use the European PAL display standard, which has more lines than U.S. systems.

You also should not assume any one keymap is being used. With the RawKey( ) function you can receive exactly what the user types. However, if he is using an alternate keymap, you will have to convert from that input to the characters you expect. While this can be done, it is messy (there is an example in the 1.2 Enhancer manual). A simpler solution is to use console.device when you are accepting input in an Intuition window. It automatically maps between the expected, standard characters and the keys typed by the user.

A subtle assumption made in many programs is that blocks of code execute without interruption. For example, a program might allocate and then use a resource without ever locking it, implicitly assuming that it will be available the entire time. Even locking the resource in the next statement is not always guaranteed to work. Another task could grab the same resource in the time between the two statements. To be safe, you must prevent this situation. You can use Forbid( ) and Permit( ) to manage task switching, while Enable( ) and Disable( ) allow you to prevent interrupts from causing your code to lose control.

Many newer programs count on features in the version 1.2 system software that were not present in earlier releases. Such programs often will visit the Guru when they are run on systems booted with earlier versions. To avoid this problem, check for the version you require by using the version number parameter of the Open Library( ) function. The following list shows the values you can currently set for that parameter.

0	any version is fine
30	requires 1.0 or higher
31	requires 1.1 or higher
32	requires the PAL release or higher
33	requires 1.2 or higher

Worth the Hassle

To meet the reasonable expectations of users, programmers should go the extra mile to make their products work well in the Amiga's multitasking environment. True, writing programs that behave well on the Amiga can be a lot of work; you always have to beware of other programs that might be running at the same time and try to share the system with them. The Amiga's multitasking capabilities, however, are among its most exciting features. Amiga users learn quickly to count on those abilities. Writing software that violates this trust often will lead those users to try other programs. When it comes to sharing resources, all Amiga programs should be well-mannered.■

We would like to thank Carolyn Scheppner of the Commodore-Amiga Technical Support group for her help both in giving us information and in supporting developers.

Mark Van Name and Bill Catchings are contributing editors to AmigaWorld. *Write to them at 10024 Sycamore Road, Durham, NC 27703.*

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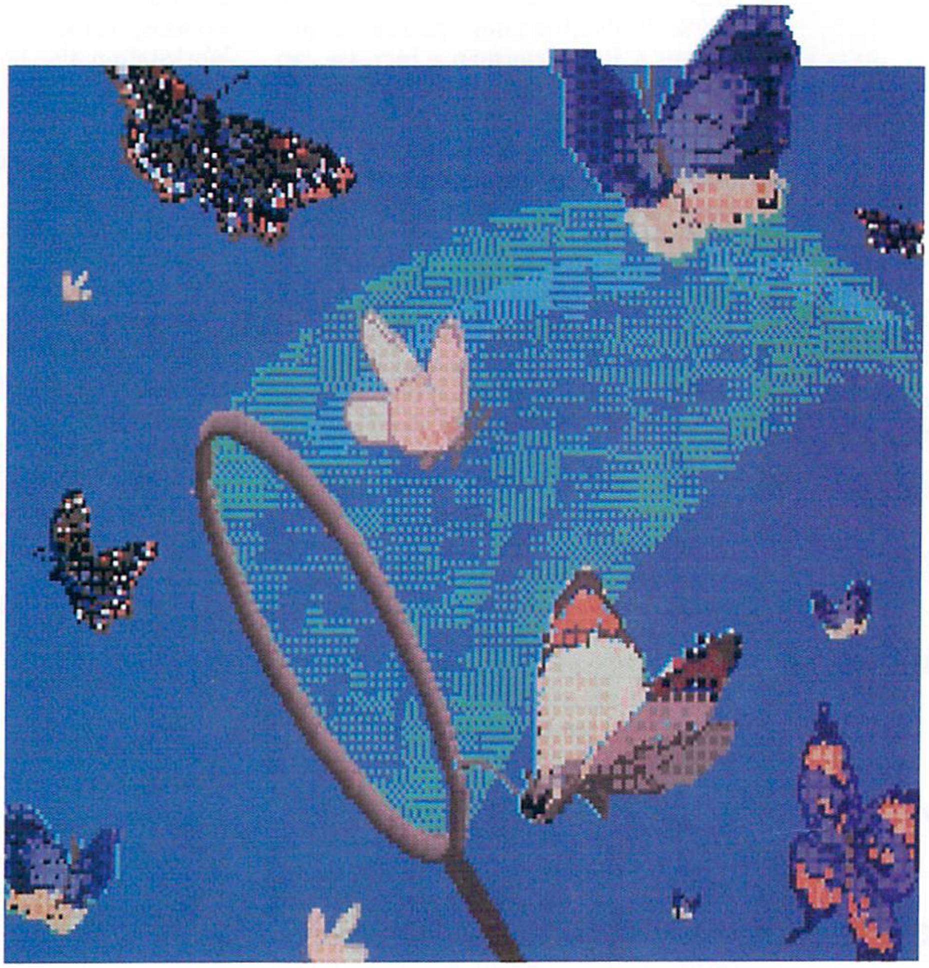
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Part I of a programming tutorial on learning to animate BOBs and Virtual Sprites with C.

By David T. McClellan

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In the article Creating Menus with Intuition in the Jan./Feb. '87 issue of *AmigaWorld*, Vincent Hopson showed you how to program basic Intuition operations—set up Screens, Windows and Menus—and how to handle user interactions through them. This three-part series will build on what you were shown in that article and will show you how to program animation on the Amiga in C. I wrote a program, *pigs1.c* (Listing 1), that I will refer to throughout this article to explain the basic techniques I used.

Due to the amount of information I have to cover, this tutorial will appear in three parts: This part covers the layout of the images; the second will cover initialization and shutdown routines; the final article will discuss object movement, screen update, interaction, and extensions. The corresponding listing sections will be presented with each article.

The *pigs1.c* program builds and animates a simple picture: two pigs running along and hopping over a wall, a flying butterfly and a drifting balloon—all passing across a simple landscape. The pigs and butterfly are built with *Virtual Sprites*, or *VSprites*; the balloon is a *BOB (Blitter Object)*. Both are described below. These animated images move in different ways, and can collide with the sides of the picture. Using them, I am able to demonstrate the major features of Amiga animation: image rendering, movement, screen updating and collision handling.

Using Lattice C (version 3.03), the total source code compiles down to about 24K. I ran it on the AmigaDOS version 1.1 kernel and operating system; changes should be minimal for version 1.2 or for Manx C.

Animation Data Structures

First, I'll discuss the data structures I use in the program. All my static data structures are shown with initialization values in the listing of file *pigs1.c*; most of the #define constants used are contained in the accompanying *pigs.h* include file. File *pigs.h* is included in each of the source files, and includes all required Lattice and Amiga include files.

My NewScreen and NewWindow structures are similar to those in Hopson's article with a few modifications. First, my screen's Type is CUSTOMBITMAP and CUSTOMSCREEN; the window's Type is CUSTOMSCREEN. I need my own BitMap to handle the eight colors and to control updating. The only window Flags I set are WINDOWCLOSE, BORDERLESS and ACTIVATE, so that I get a close gadget, no borders and the window comes up active. To match those, I set the IDCMPFlags CLOSEWINDOW and REQCLEAR, so that I can receive CLOSEWINDOW messages for exiting the program. The screen has no menus attached, and its colors are given early in the *scrcolors*[ ] array.

In the listing, I initialized the NewScreen struct in the static data section; I did the NewWindow struct in my setup() routine (described in the next article). From now on, when I give a routine name in the article I'll follow it with () so you know it's a specific routine. The names of routines in my tutorial program all begin with lowercase letters; Amiga library routines begin in uppercase. Following the screen and window structure declaration, I laid out the VSprites and the BOB; after discussing these in general I'll show you what I did.

Graphic Elements

The Amiga uses two basic types of animation: sprite animation and blitter animation. Collectively, objects from both are called *Graphic Elements*, or *Gels*. Sprites are Gels supported by special hardware; they move independent of, and freely across, the background image (the *playfield*) without affecting it. The Amiga supports eight sprites, each of which is produced by one of eight hardware sprite Direct Memory Access (DMA) channels. (The Workbench pointer is a sprite.) The ►

width of a sprite is limited to 16 pixels; their height is not limited. They can have only three colors, plus "transparent." Sprite images can be specified and changed (like the cloud of Z's the pointer turns into), and are very easy to move. Sprites can optionally be managed by the system software and assigned as VSprites.

VSprites are system software Gels closely related to hardware sprites in data structure and are used by the software graphics kernel to expand on sprites. VSprites are temporarily assigned to sprites as needed. More than eight VSprites can be active at one time because, as the screen is refreshed, the Amiga can reuse hardware sprites to carry VSprite images. Each VSprite has its own special color set, the colors of which do not have to be part of the screen's set. VSprites also allow you to do double buffering and collision detection (running into borders or other VSprites or BOBs), which hardware sprites can't do on their own. Certain restrictions apply to VSprite use: More than four VSprites on one horizontal screen line (scanline) can cause problems with color interaction, and there can't be more VSprites on a scanline than there are sprites. VSprites are easier to use and track than sprites, so I used them for my demo.

Blitter animation offers more freedom than VSprite animation. BOBs can be as wide as you want and can have as many colors as the screen, up to 32, but drawing them costs more time, in blitter work. Unlike VSprites, which are drawn over the background, BOBs are drawn *into* the background scene. Therefore, each time a BOB moves, the Amiga blitter has to save a copy of the area it is moving the BOB to, restore the copy it saved of the area the BOB was sitting in, and then redraw the BOB. This takes time when several BOBs are hopping about, each of which can potentially overlay not only background, but other BOBs as well! I have one eight-color BOB I move around to show how setup and movement of this differs from VSprite usage.

Figure 1. The butterfly VSprite image with its bit and word mappings.

```
Line   Image Colors (blank = trans., B = black, R = red, G = green)
       Bit (from left) 0123456789012345
----   ----------------------------------------
  0                         B    B
  1                    RR    B  B    RR
  2                    RGRGR  BB  RGRGR
  3                     GRRGRGBBGRGRRG
  4                      GGBGRBBRGBGG
  5                       RBRGBBGRBR
  6                      RGRG BB GRGR
  7                     RGRG  BB  GRGR
  8                    R      BB      R

Bitmap  Data: Bits 0-15 low                              Word array
Line    order color bits,                                  (from Bitmap)
                                                           in hexadecimal
         Low bit of color     High bit of color
        0123 4567 8901 2345  6789 0123 4567 8901¼        Low, then High
        -------------------  -------------------        --------------
   0    0000 0100 0010 0000  0000 0000 0000 0000        0x0420, 0x0000
   1    0000 0010 0100 0000  1100 0000 0000 0011        0x0240, 0xC003
   2    0101 0001 1000 1010  1111 1000 0001 1111        0x518A, 0xF81F
   3    0100 1011 1101 0010  0111 1110 0111 1110        0x4BD2, 0x7E7E
   4    0011 1101 1011 1100  0011 0110 0110 1100        0x3DBC, 0x366C
   5    0000 1011 1101 0000  0001 0110 0110 1000        0x0BD0, 0x1668
   6    0001 0101 1010 1000  0011 1100 0011 1100        0x15A8, 0x3C3C
   7    0010 1001 1001 0100  0111 1000 0001 1110        0x2994, 0x781E
   8    0000 0001 1000 0000  1000 0000 0000 0001        0x0180, 0x8001
```

Pigs, Butterflies and Balloons

I use six VSprite structures: two apiece for each of the two pigs, one for the butterfly, and one for the BOB. (Each BOB has an associated VSprite structure for movement and image control, though it doesn't actually use a hardware sprite.) I draw each pig with two side-by-side VSprites, allowing me 32 pixels of image width; I just have to be careful not to visually "dissect" the pigs on-screen when I move them. The pigs are 11 pixels tall, and colored with pink, red and dark blue (and, of course, transparent). The butterfly is only 16 pixels wide, uses one VSprite, and is nine pixels tall. Its colors are red, green and black. A close look at the butterfly will illustrate how to lay out a VSprite.

In the include file *pigs.h*, I first define some constants to use later when allocating the VSprite: height, width, etc. (Some of the defines are for my VUserStuff VSprite field, which I will get into in the articles on setup and movement.) First, I set the butterfly's colors in the array *BflyColors*[ ], giving the red-green-blue values for colors 1, 2, and 3 of the VSprite. Transparent is always color 0. Color 1 is black; color 2 is red, and color 3 is green. Using these indices I describe the butterfly's image.

A VSprite's image is described one screen line at a time, two 16-bit "words" per line (two bits of color by 16 pixels of width). The first word of each line contains the low-order 16 bits of its color indices; the second word contains the high-order bits. I drew the butterfly on graph paper first, picked colors for each pixel, and then used the indices to get the word values. See Figure 1 for the image and the bit and word mappings.

Using the image in Figure 1, for example, the first four pixels of line 1 are red, red, transparent, transparent. The corresponding VSprite color indices are 2, 2, 0, 0 (or 10, 10, 00, 00 in binary). Splitting each index's two bits in two to get the two color planes gives 0000 and 1100, 0 and C in hex. Doing this for an entire image takes time, but isn't too difficult. I drew the pigs using a paint program and used the magnify option to blow up the pixels and transfer them to graph paper for translation into hex numbers.

Besides its image and color, each VSprite has a position (X,Y), and Flags (mostly used for BOB VSprites). The only Flags bit of interest is VSPRITE; if set, it indicates the VSprite is an independent VSprite; if not set, the VSprite belongs to a BOB. The other fields of the VSprite pertain more to movement and collision detection, so I will delay describing them until next issue.

BOBs are not much more complicated than VSprites; they have a few more flags and elements to be initialized, and their image array is laid out a little differently. They also have an associated VSprite ►

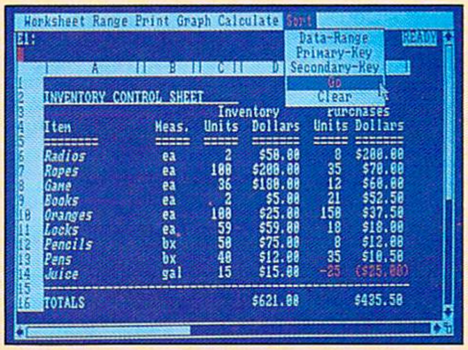
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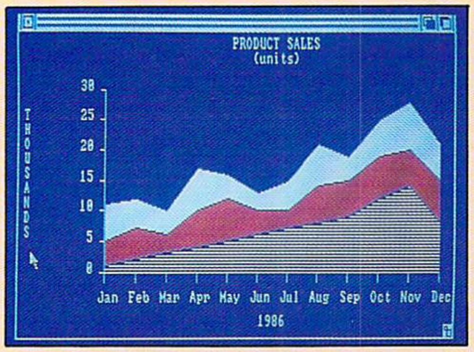
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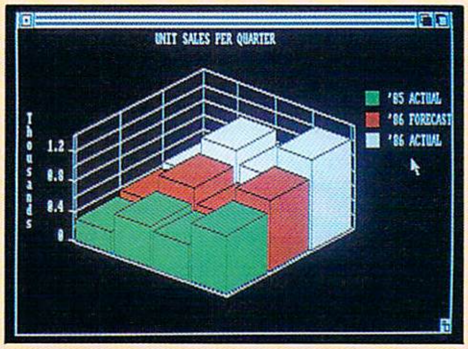
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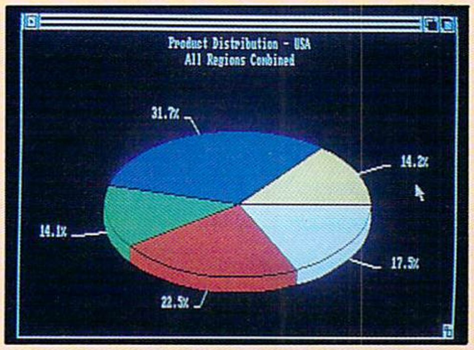
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(BOBVSprite) for their VSprite-similar data (image, X,Y, collision information, etc.). The BOB image is laid out one whole bit plane at a time as opposed to the alternating plane method used for VSprites. I have three bit planes so I had three sections of my array—24 lines each and two words wide (the BOB is 32 pixels wide—two words—and 24 pixels high).

Dissecting an image in this form is similar to doing it for a VSprite. I first drew the image in eight colors (including transparent, see the OVERLAY flag below). I then transferred the color index number for each pixel to its corresponding location on graph paper. Then, scanline by scanline, I converted each number to three-bit binary and split the three bits into three separate parts of the image array. For example, on the fourth line of the BOB, the first six pixels were transparent (color 0), the next four yellow (color 3), then one red (color 6), one black (color 1), two more reds, three dark blues (color 7), three greens (color 4), one white (color 2), one black, two more whites, two more yellows and six more transparent pixels for a total of 32. The 32 color numbers, separated into three planes to become six sixteen-bit hexadecimal numbers, were thus:

Plane 0 (lowest bit):	0x03D3 0x84C0
Plane 1 (middle bit):	0x03CF 0x8BC0
Plane 2 (high bit):	0x002F 0xF0C0

If I do much more animation, I will either write or buy a program to generate the C data structures from an image; it takes a while to translate the bits!

Other BOB fields allow controlled variations of the image displayed. Two of the BOB's VSprite's fields control which of these color bit planes are drawn at runtime (PlanePick and PlaneOnOff); I set mine to draw all my bit planes, all the time. By changing these fields before you update the screen you can cause a single BOB to display several images.

A BOB keeps a few other arrays, too: for saving the background (SaveBuffer), and for use with double-buffered screens (DBuffer, DBuffer->BufBuffer); more on that in the third article. The BOB has flags for both its own Flags field (for use with AnimComps), and two special VSprite flags I use, SAVEBACK and OVERLAY. SAVEBACK causes the Amiga to save the background pixels the BOB overlays in the BOB's SaveBuffer; if it is off, the BOB acts like a paintbrush and smears across the background. OVERLAY causes the BOB to be drawn like a VSprite with transparency (color 0), so the background image shows through.

The memory allocated for these structures *must* be in the lower 512K of the Amiga's memory—the chip memory. My Amiga has only 512K, so I know my statically allocated image arrays are in chip memory. If the program were to be loaded into memory above 512K then I would have had to allocate chunks of chip memory the size of the images and then copy the static image arrays into those chunks.

That's it, for now. In the next article I'll cover program initialization and linking these VSprite and BOB data structures into the Amiga's runtime screen display, along with the relevant parts of the Pigs program.■

David McClellan is a Contributing Editor to AmigaWorld. *Address correspondence to him at 104 Chevron Circle, Cary, NC 27511.*

Listing 1. Pigs1.c

```
/* Program: pigs.c, part 1 by David Mclellan
This program creates a simple animation demo with
several VSprites and a Bob moving across a
background scene. The moving objects are: 2 pigs,
each consisting of 2 VSprites side-by-side; 1
butterfly which uses 1 VSprite, and one 8-color Bob.
Note:  This program was written under version 1.1
File: pigs1.c--data structures for tutorial program.
Include Files. Note - pigs.h includes all required
                Amiga Include files.  */
#include "pigs.h"
/* Global Data Structures */
/* Library Pointers */
struct IntuitionBase *IntuitionBase;
struct GfxBase *GfxBase;
/* Screen Colors */
struct color4 scrcolor[8] = {          /* Screen colors */
        0x00, 0x00, 0x0F,            /* Color 0 - Blue */
        0x00, 0x00, 0x00,           /* Color 1 - Black */
        0x0F, 0x0F, 0x0F,           /* Color 2 - White */
        0x0F, 0x0F, 0x00,          /* Color 3 - Yellow */
        0x08, 0x0F, 0x08,  /* Color 4 - Light Green */
        0x08, 0x08, 0x08,  /* Color 5 - Medium Grey */
        0x0F, 0x00, 0x00,             /* Color 6 - Red */
        0x0F, 0x0C, 0x00           /* Color 7 - Orange */
};
/* Screen Miscellanea */
struct TextAttr ffont = {
   "topaz.font", TOPAZ_SIXTY,
   FS_NORMAL,
   FPF_ROMFONT
};
struct NewScreen newscr = {
   0,0, WIDTH, HEIGHT, /* Left, Top, Width, Height */
   3,                                        /* Depth */
   BLACK, BLUE,               /* DetailPen, BlockPen */
   0,                                    /* ViewModes */
   CUSTOMSCREEN | CUSTOMBITMAP,               /* Type */
   &ffont,                                    /* Font */
   "Animated Pigs",                          /* Title */
   NULL,                                /* No Gadgets */
   NULL            /* Until Allocate CustomBitMap */
};
struct Screen *scr; /* Real screen from OpenScreen */
struct BitMap *bitm = NULL;
                            /* Custom BitMap storage */
/* Window Info */
struct NewWindow newwin;
                      /* Initialized in setup routine */
struct Window *win;/* Real window, from OpenWindow */
struct IntuiMessage *message; /* For getting messages
             from Intuition, such as CLOSEWINDOW */
unsigned long close_mask = 0;        /* Mask used by
         close_up_shop to decide what to close. */
/* Gel Information; tracks VSprites and Bobs */
struct GelsInfo *GInfo;            /* For InitGels */
/* VSprites and Related Info */
/* Butterfly Info */
short bfly_ys[BFLY_CYCLE] = { 4, 8, 14, -6,  0, -10,
            2, -20,  4, 8, -16, 2,  -6, 14, 0, 2};
/* Butterfly has cyclical up/down moves */
/* Colors */
WORD PigColors[] = { 0x0F44,                /* Pink */
                     0x0F00,                /* Red  */
                     0x000C            /* Dark Blue */
```

Listing continued on p. 98

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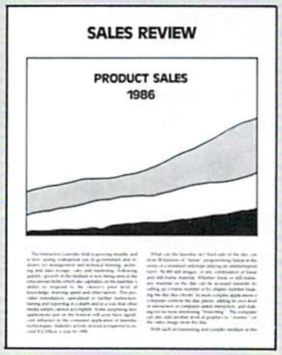
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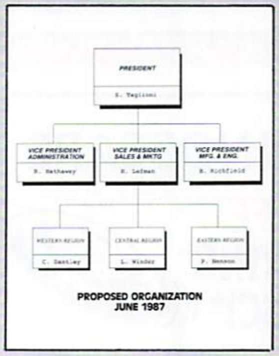
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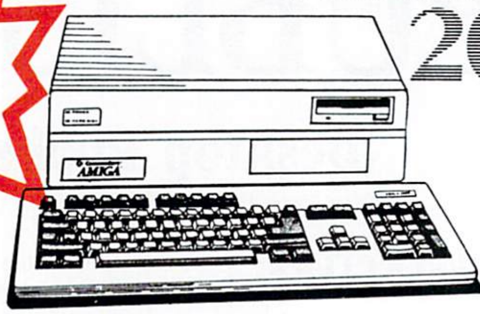
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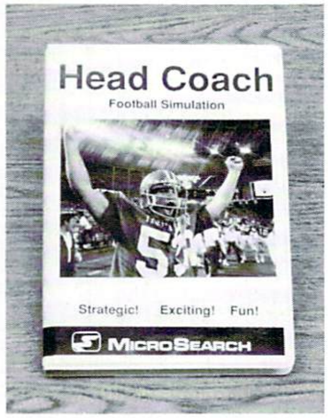
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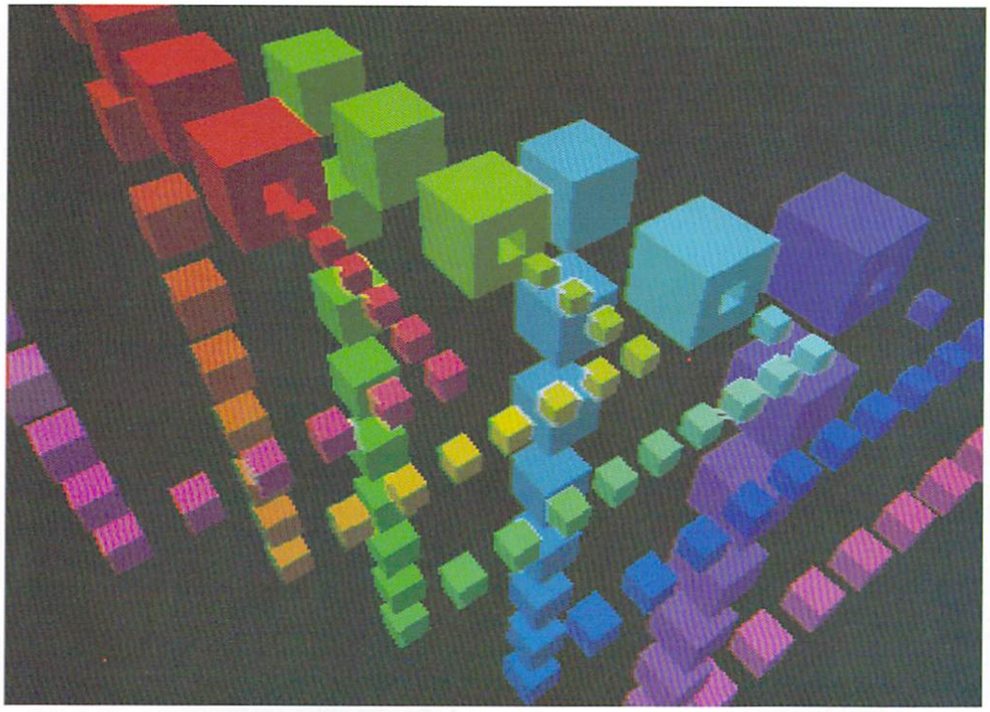
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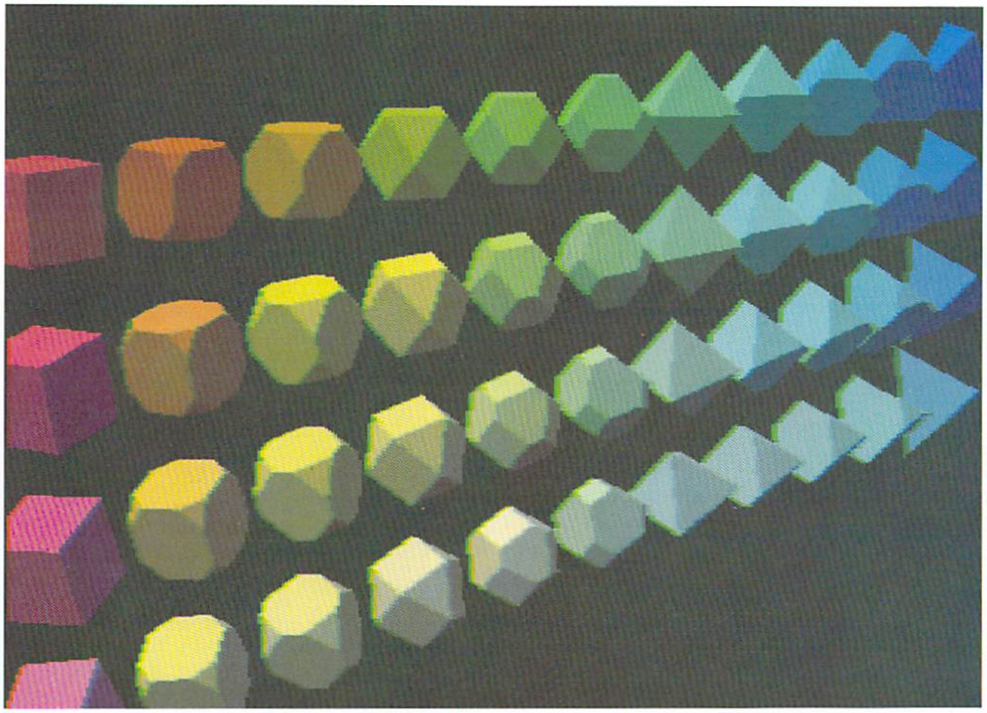
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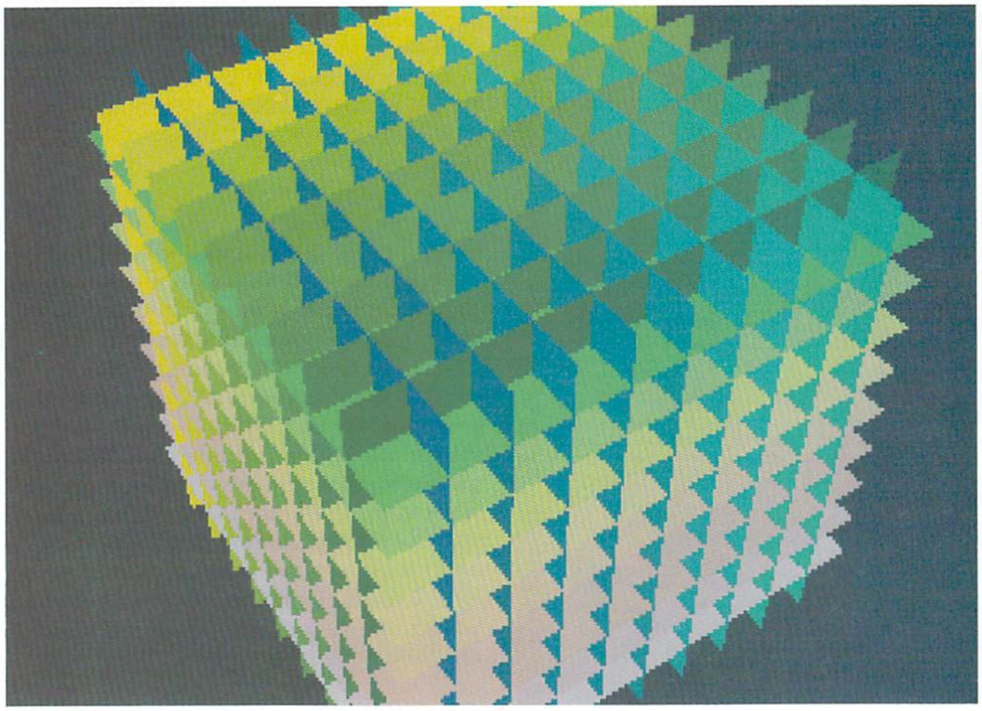
MICHAEL ABRAMS of Hinckley, Ohio, created these 320 × 400 Hold-and-Modify images with his own 3-D paint program. The program does things like 3-D rotation, and takes into account the "observer" as well as the objects.

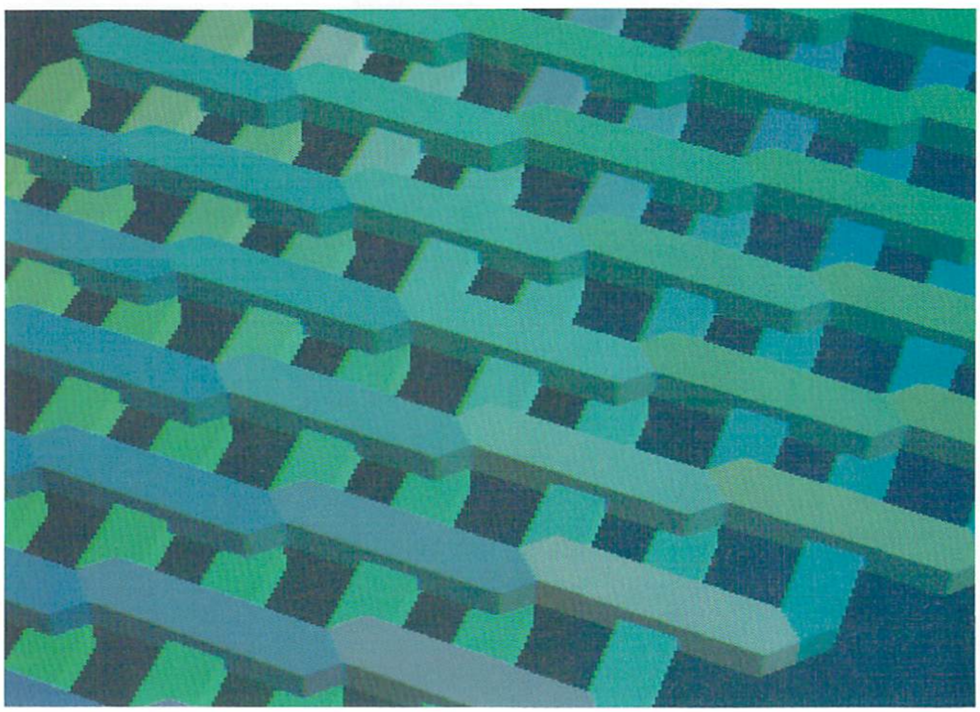
The Amiga is Michael's first computer, but he had "played on and off" for a few years creating 3-D graphics with a program he wrote on—believe it or not—a programmable calculator. Writing the Amiga program took him about 10 months: In that time he learned "how computers work," the C language and AmigaDOS, developed the mathematics (Michael has a degree in Physics and works as a machine designer), programming strategy and program design, learned the ROM Kernel functions and did the actual programming and debugging, and played with the program "just to see what I could get it to do." We think Michael got it to do very nice things, and is doing OK for a "hobbyist!"

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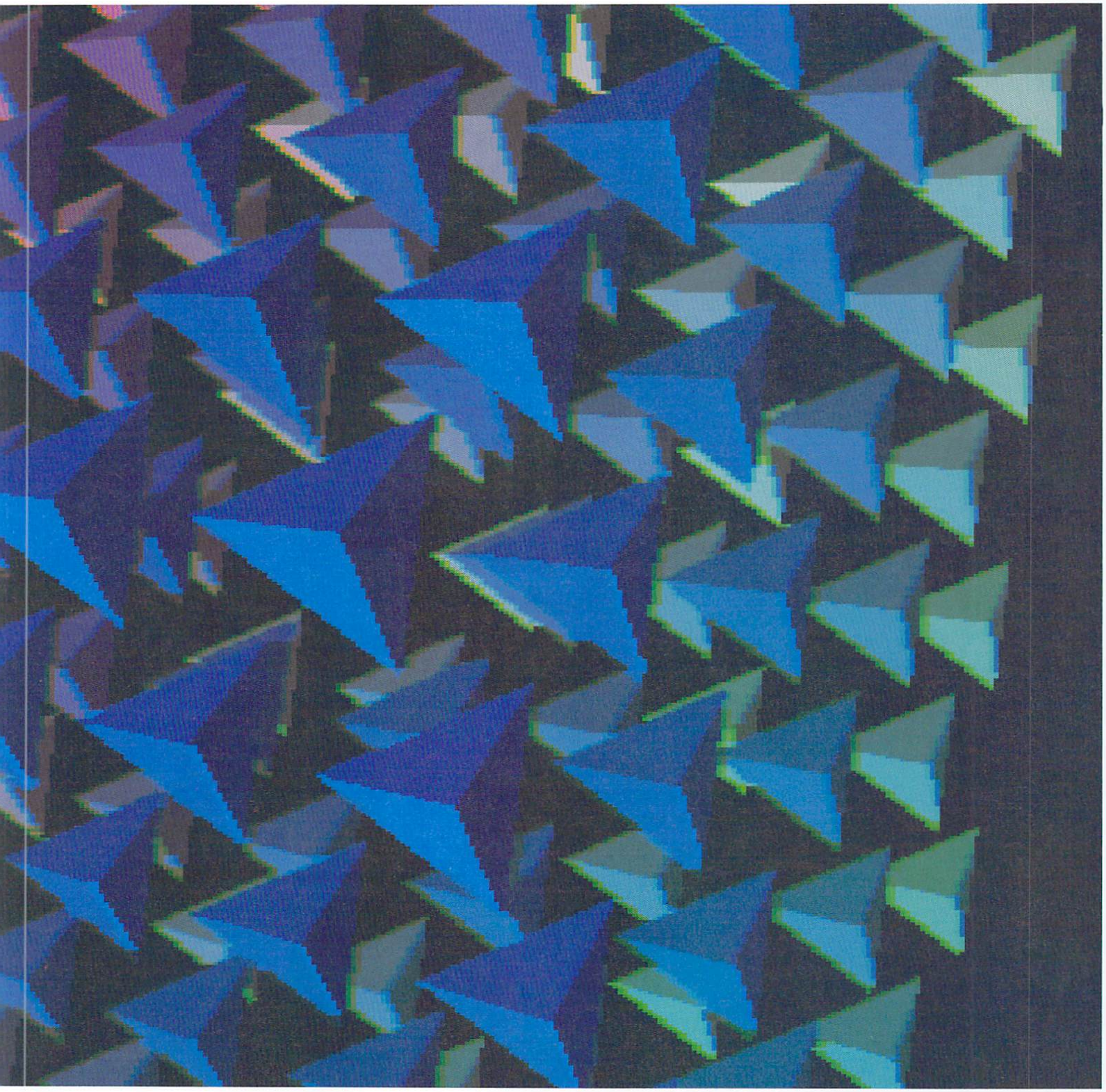
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Reviews

Xerox 4020 Color Ink Jet Printer

Yet another printer tries to capture the color and light of Amiga graphics on paper.

By Morton A. Kevelson

THE AMIGA's amazing graphics capabilities generate the concept that all of its associated peripherals will perform with equal competence. Unfortunately, computer technology, which is primarily electronic, has progressed far faster than printer technology, which is primarily mechanical. But printer technology is progressing with impressive results, as the Xerox 4020 Color Ink Jet Printer proves.

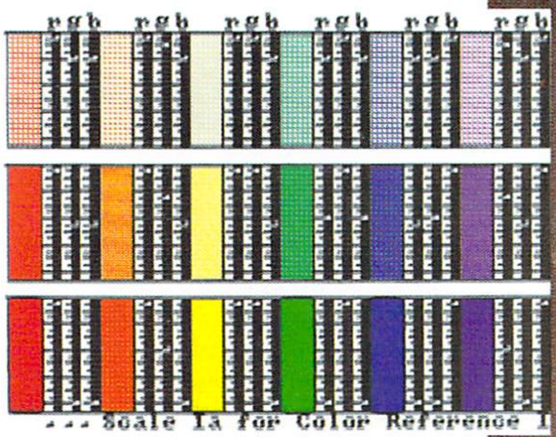
Putting It Together

As with other ink jet printers, the 4020 uses four colors of ink—black, cyan, magenta and yellow. The inks are supplied in cartridge doses of 5cc per color. A single set of cartridges turns out about 30 full-size horizontal dumps, with the black ink running out fastest. To replenish the ink supply, you simply puncture the top seal on the cartridge by inverting its cap and insert the cartridge into the proper ink well to drain. Even if you are color blind, you can't insert the cartridge into the wrong place. Each color is mechanically keyed to its corresponding well.

In addition to the ink cartridges, the Xerox 4020 requires a Maintenance Fluid cartridge, containing 175cc of distilled water. The cartridge slips into a hatch in the front of the printer and supplies the water used to flush the ink jets and to keep the heads wet during normal operation. The cartridge also serves as a reservoir for waste fluids generated while printing.

You need never get into the printer to clean the ink jets during normal operation. The 4020 automatically handles all the ink jet cleaning. Every time the printer is turned on it goes through a 30-second uncapping cycle, which clears the ink jets for operation. If the print quality is substandard, you can initiate a Recovery Cycle by pressing a button on the rear panel. The four-minute operation thoroughly cleans and flushes the ink channels.

You must turn off the Xerox 4020 with its own power switch located on the rear left ►





A color scale and HAM image from the Xerox 4020.

of the printer, not a separate power strip switch. After its power switch is turned off, the 4020 goes through a one-minute Normal Shut-Down cycle, which caps the ink jets and flushes out the remaining ink. All the maintence operations are accompanied by whirring and whooping, but these are the loudest noises the printer will ever make. Normal operation of the 4020 is rather quiet compared to dot matrix printers.

Once it's set up, avoid moving the printer. Excessive movement can stir up the inks and inject air bubbles into the channels, necessitating a Recovery Cycle. If a major move is required, then you should perform a Wet Shut-Down, an extended shut-down cycle.

The front panel has membrane pushbuttons for the form feed, line feed and start/stop functions. There are also indicating lights for each of the four ink cartridges as well as paper out, ready and power on. A set of miniature dip switches for setting the default font, character set, line feed and so on is located on a recessed back panel along with the Centronics connector, the test pushbutton and the Recovery Cycle pushbutton.

The Supporting Cast

The 4020 comes with full ink reservoirs, a Maintenance Fluid cartridge, several sheets of coated paper and a small vial of ink. The printer is equipped with a friction feed paper drive that accepts sheets up to 11 inches wide; however, the maximum print line is nine inches. Everything else is optional. A $175 starter kit includes a 165-foot roll of 8½-inch-wide coated paper, a roll paper holder, 250 single sheets of coated paper, 50 transparencies, two sets of ink cartridges and a single Maintenance Fluid cartridge. The roll paper holder ($27.50) is an essential accessory and it may now be purchased separately. Overall, the cost of supplies for a full-sized color dump on paper is a rather steep 60 to 70 cents.

Art Isn't Easy

The Xerox 4020 has a horizontal and vertical resolution of 120 dots per inch. You can enhance the resolution by offsetting the dot position 1/240th of an inch, effectively doubling the dots. While graphic dumps are virtually free of horizontal lining, horizontal lines do occasionally show up very faintly in large areas of a single pattern or color. Colors have a satisfying intensity and saturation. The black on the 4020 is the deepest I have seen on a computer printer. In addition to the four basic colors, the 4020 can blend the inks to generate solid areas of red, green and violet.

Besides the seven colors directly supported by the printer, additional shades are achieved by dithering and are a function of the printer driver. To generate a scale of greens, the 4020 sparsely prints green dots on a white background and gradually increases the dot density. When the output reaches a solid green, the machine prints black dots for the darker shades. The dark end of the scale is a black field with scattered green dots.

Although the resulting dumps were detailed and generally attractive, they did not match what I saw on the screen. In particular, light blues printed toward dark blue and dark blues printed toward purple. Flesh tones were slightly saturated and toward the red. The on-paper image was a reasonable match to the monitor display with the brightness control turned down. Interestingly enough, Hold And Modify (HAM) images, created with Digi-View from NewTek, resulted in printouts that were very close to the original.

Printing times were rather long. A full-sized horizontal dump ran about 12 minutes. A full size vertical dump of a 640 × 400 pixel image took nearly half an hour. By comparison, the Canon PJ-1080A generated the same size dumps in about one third the time.

Text quality was very good in draft mode and excellent in near letter quality (NQL) mode. The character matrix is 12 dots wide and 20 dots high with a 1/240-inch offset in NLQ mode. Printing speed is rated at a slow 80 cps in draft mode and a reasonable 40 cps in NLQ mode.

In comparison with the color graphic printers I am familiar with (the Canon PJ-1080A and the Okimate 20), the Xerox 4020 is the clear winner based on the overall quality of its color graphic dump. Text quality in NLQ mode is also very good (far better than the PJ-1080A, which lacks lowercase descenders), although printing speeds are rather slow. Printing text in color cuts speed in half. As with all ink jet printers, the 4020 requires a special clay-coated paper for best results. While coated paper may not be suitable for some office applications, photocopying the documents onto your own letterhead will avoid the problem. If your budget can stand the strain, the Xerox 4020 is worth the investment.

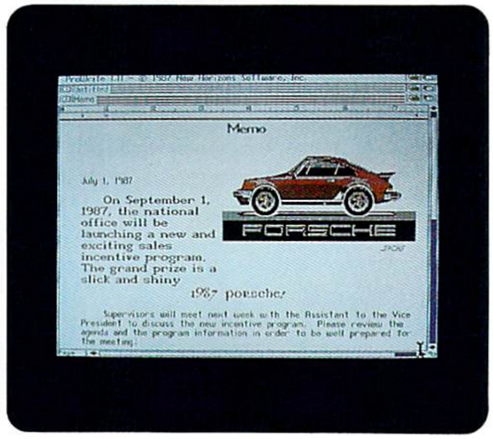
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ProWrite

Whether you're writing a business presentation with graphs or an illustrated letter to your aunt, help is on the way.

By Louis R. Wallace

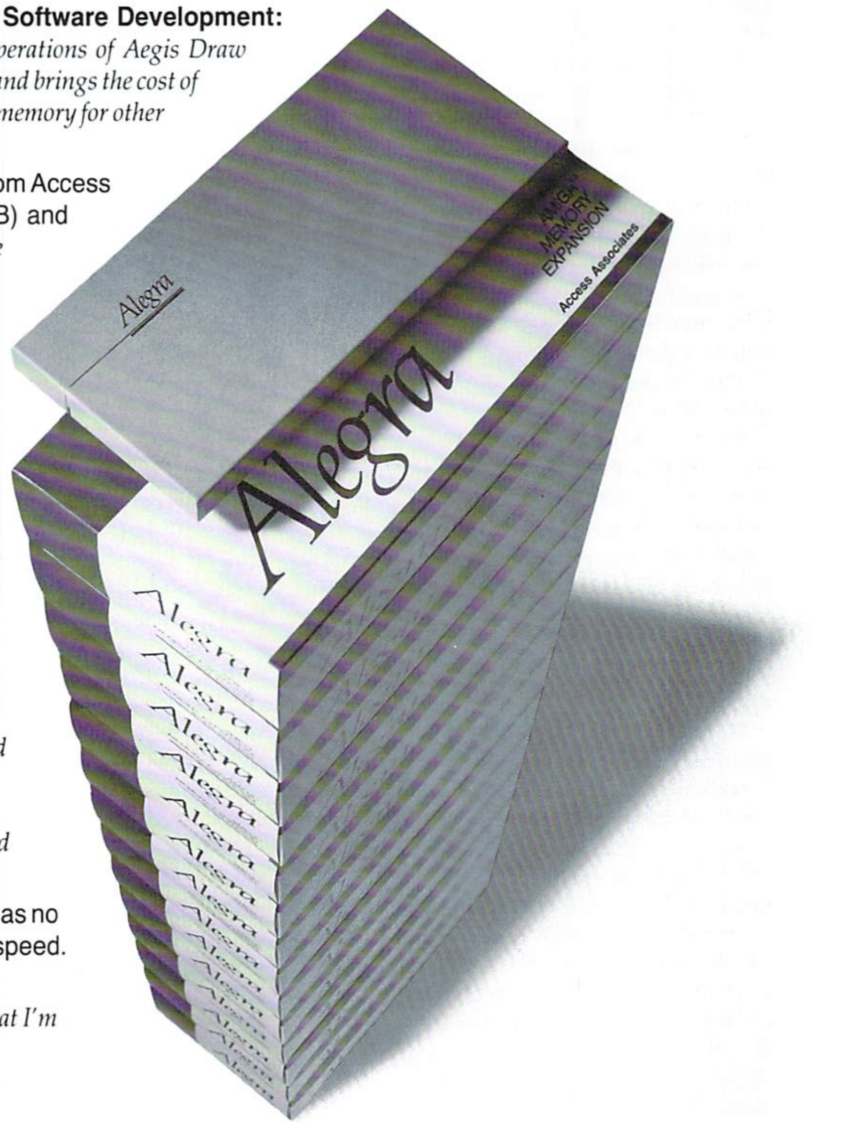
IN SPITE OF the Amiga's graphics capabilities, none of the early word processors offered the Macintosh-like capabilities long expected in a word processor. Enter ProWrite, the first graphic word processing system for the Amiga. Besides standard text



manipulation features, ProWrite has the ability to use multiple fonts on the same screen and to incorporate artwork into your documents.

The most noticeable aspect of ProWrite is its standard display—a 640 × 400 interlaced screen that holds twice as much information as the normal 200 scanline screen. While the larger, more detailed fonts provide sharper text, the interlaced screen flickers annoyingly. To compensate for this, ProWrite let's you toggle back and forth between the normal screen colors and a set of subdued, low-contrast colors. The low-contrast colors minimize the flicker, but do not remove it completely. Inexpensive plastic screen filters (such as Jitter-Rid from Ideas Created and Flicker Master from T.S.R. ►

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Hutchinson Co.) will eliminate most of the flicker, as well. A more expensive solution is to get a high persistance monitor, which will remove the flicker entirely.

Responding to complaints about screen flicker and the memory limitations (caused by the memory hungry 640 × 400, eight-color screen) of the original release, New Horizons recently added to the distribution disk a second version of ProWrite with a 640 × 200 non-interlaced screen. (The upgrade is free to all registered owners.) Text and graphics are twice as tall on the non-interlaced screen as they are on the interlaced display, but all other functions are the same.

Objects d'Art

As mentioned earlier, ProWrite will integrate text and graphics generated with any IFF paint or CAD programs. You can use complete pictures or smaller objects such as DeluxePaint brushes and Aegis Images windows. To include artwork in your text, just copy the file to the ProWrite disk and open it from within your document. A requestor offers you a choice of full, partial or no shading. Your decision depends on the image itself, how you want it to appear and how much memory is available. ProWrite then converts the image into its three-bit-plane (eight-color) format. Pictures made using a larger palette will lose some of their colors.

ProWrite works with any of the printers supported by Preferences, so you can get a color, laser-perfect or dot-matrix printout without hassles. (You can also get a no frills plain draft output if you need to.) The only drawback with printing documents containing graphics is that since they are essentially bitmap screendumps, they take much longer to print than a simple text draft of the page.

Since ProWrite uses a custom screen, it requires much more memory than a simple Workbench type screen. However, you can get 15 to 25 pages of text in a 512K Amiga, which should be suitable for most documents. With an extra two megabytes of memory, I was able to get 100 pages of text in one document with no problems. (Of course, because of chip RAM limitations, you could not have that many pages with graphics on them.) Even with a document that size, there was no serious degradation of performance in ProWrite. (Textcraft and Textcraft Plus, on the other hand, become painfully slow with over 30 pages in memory.) However, I would not recommend using ProWrite for serious work involving long documents. It is best suited for short, graphically intensive output.

For Writing and Rewriting

Besides the special features, ProWrite offers many standard word processing functions. The cut, paste and copy features are accessible through the mouse and pull-down menus or keyboard commands. You can copy the format used in any designated area to any other area, or search and replace a character, word or sequence of words. Another useful feature allows you to skip to any specified page.

Since ProWrite is a WYSIWYG (What You See Is What You Get) word processor, it displays bold, italic, underlined, superscript and subscripted text on the screen exactly as it appears, not as a cryptic set of codes. You can use any of the supplied Workbench fonts in eight different colors, with the colors and fonts freely mixed on the page. Be aware, however, that printing text with custom fonts takes as long as printing graphics.

ProWrite has the standard justification features, including left and right alignment, centered and full-justified text. You can switch between single and double spacing with a keypress or a mouse click. It also has variable tab types.

You can include headers and footers in your document, as well as title pages. You can insert page breaks with page numbers in any of five different styles anywhere you want, or let ProWrite do it for you.

The screen display is the standard Amiga style, with left, right, up and down scroll bars. You can set the margins and indentations with gadgets in the border, and toggle the ruler between inches and centimeters. The only difficulty with the margin feature is that the program doesn't provide an easy way to select an entire document so that you can reset the margins globally (or change the font, for that matter). You have to drag the cursor over every paragraph in order to change the margins of the entire document. The program also lacks some of the features required for many serious word processing applications, such as a footnote option and a spelling checker.

Basically, I like ProWrite. It is simple enough to use that you can almost immediately start creating documents. It is a reasonably well behaved program and will multitask, if you have enough memory. ProWrite is as powerful as most of the existing Amiga word processors, and it offers features that cannot be duplicated on any other Amiga package. If your word processing needs are such that multiple fonts, colors and graphics are important, and you do not need to write large documents, ProWrite is for you.

ProWrite
New Horizons Software
PO Box 43167
Austin, TX 78745
512/280-0319
$99.95
512K required.

Spellcraft and Nancy

Are you therowly . . . thouroghly . . . thoroughly confused by spelling? There's hope in sight.

By Al Willen

AS A PROFESSIONAL writer, I've come to look at spelling checkers not so much as niceties but as vital necessities. While Amiga word processors are slow to appear, spelling checkers are in abundance. I tested Spellcraft from Megatronics and Nancy from Finally Software. Nancy consistently outperformed Spellcraft in timed tests, while Spellcraft had fewer unrecognized words. Neither program is copy-protected, and both work with either drive. Besides straight ASCII files, the programs accept documents from commerical word processors such as Scribble! and Textcraft.

Spellcraft

Spellcraft is extremely easy to use, due to the program's clean design and well organized manual. The System dictionary, comprised of a Read-Only disk dictionary and a RAM dictionary that is loaded into memory at the start of every proofing session, contains a respectable 40,000 words. If desired, you can define your own specialized disk dictionaries.

The program opens with a series of set up questions, including the choice between Interactive and Non-Interactive proofreading. While the non-interactive method improves checking speed, it introduces more human misinterpretation errors into the document. Non-interactive proofreading opens a file, then scans each word in the document, comparing the source word to a dictionary or index. If the word doesn't ►

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match anything, that word only is displayed so that you can instruct the computer to ignore, add or correct it. Since words are presented out of context, you cannot positively know if the word is missing from the program's dictionary, misspelled because of context or in error because of omission of part of the word. Interactive proofing corrects this shortcoming by displaying eight lines of the surrounding sentence or paragraph and highlighting the word in question. In both modes, Spellcraft will beep every time a word is suspected.

In Non-Interactive Mode, if a possible misspelling is found, the computer choice buttons appear at the bottom of the screen, giving you the option of ignoring the word throughout the entire document, skipping the word once, looking up the word via a word template, a letter pattern followed by a question mark, or fixing the word.

Suppose the suspect word is "Califormia." By clicking on the Look Up button and typing "cali?" the program displays words beginning with cali. You can then substitute one of the suggested words for the error, scan the dictionary for additional words that match your template pattern, or abort the lookup procedure. To correct misspelled words yourself, click the Fix Word button and type the correct spelling. If a user dictionary is active you can add the new word to the dictionary at the end of the session. Upon completion, you can exit or check another document.

Though easy to learn and use, Spellcraft does have some problems. If you forget the name of the document you wish to proofread, you're in trouble. Spellcraft has no way to list the directory of your document disk and there's no CLI open option. In Interactive Mode, long sentences obliterate screen borders. Rather than refresh the entire screen when a new copy block is displayed, the border is still obscured with prior copy. The biggest problem with Spellcraft is speed, or rather lack of it. I can type faster than this program can scan a document, and 36 seconds to load the RAM Dictionary is too long to wait. The forthcoming update from interpreted to compiled BASIC should speed things up a bit.

But for the price of about half of most other spellcheckers on the market, Spellcraft is highly reliable and user-friendly. To top off the bargain, Megatronics' customer service is tops.

Nancy

Though not as cosmetically polished as many spellcheckers, Nancy boasts tremendous user-defined versatility and competitive processing speeds. With a built-in 80,000 word dicitionary, twice the size of Spellcraft's, this spelling checker gives you a variety of ways to proofread a document, all controlled via an initialization file that you create and modify through pull-down options. In addition, you can specify up to four user dictionaries and four automatic corrections lists.

The RAM Dictionary loads quickly into memory followed by the first 20-line block of text. Like Spellcraft, Nancy operates in Non-Interactive and Interactive modes. Regardless of the mode chosen, Nancy displays a text block and sequentially highlights the word being scanned. However, in Non-Interactive mode, the program doesn't correct the word or suggest possible spellings, but puts a user-defined placemark before suspect words for later correction.

Nancy comes alive in Interactive mode. Nancy can be set to read and spell suspect words aloud, though this slows down the search. If a possible mistake is found, you can skip the word, add the word to a user dictionary, request alternate spellings (though unlike Spellcraft, a character template is not supported), not correct the word but count it as an error, type in the correct spelling (which updates the error count) or count the word as an error and remember all further occurrences of the misspelling. A final option adds the misspelled word to a special user-defined corrections list and adds the correct spelling in a user-defined word list. Not only will Nancy remember word dictionaries, but it will remember and correct frequently misspelled words.

At the end of a proofing session, Nancy displays the total number of words in the document and total misspelled words, then returns to Workbench without any restart option.

While the Word Suggest option doesn't provide enough substitution choices, the biggest problem with Nancy (Version 1.1) is that I don't feel it is totally reliable. Throughout testing, Nancy had a nasty habit of deleting parts of my text as it scanned through my Textcraft documents. The deletions were not apparent while Nancy was actually proofing, but after the session when I loaded the altered document back into Textcraft, I found seemingly random word patches missing. Also, Nancy interpreted words such as California as two separate words Cali and fornia. Nancy has fantastic potential and I hope the soon to be released upgrade does it justice.

Spellcraft
Megatronics
55 N. Main St.
Logan, UT 84321
801/752-2642
$24.95
512K required.

Nancy
Finally Software
4000 MacArthur Blvd., Suite 3000
Newport Beach, CA 92663
714/722-2922
$49.95
No special requirements.

Promise

If you don't have a fussy editor to read over your shoulder and correct your mistakes, a spelling checker is the next best thing.

THE PROMISE spelling checker features a dictionary of over 95,000 words, checks documents at a rate of 1,080 words per minute, lets you create custom dictionaries, has a rudimentary punctuation checker and offers a "spell help" mini-word checker that takes advantage of the Amiga's multitasking abilities by letting you check individual words without leaving the word processor. Some of the other nice features of Promise are its ease of use, clear directory window set up, it can be installed on a hard disk or check files stored on hard disks labled HD0:, it gives you a word and error count, the ability to merge custom dictionaries, load them independantly or not use them at all and a wild card feature.

The handy wild card function lets you search for words using either an asterisk (indicating an unknown letter or letters) or a question mark (indicating an unknown letter). If you can't remember how many "l"s there are in the word really you could search for rea*y, or if you don't know if it is i before e or e before i in deity, you could seach for d??ty.

Promise does have a few drawbacks. The punctuation checker is turned off as the default, so you have to remember to turn it on each time. You can't indicate the format of the document to be checked, and, while this might not be a major problem when checking a document (you can always tell Promise to ignore the funny format strings that most word processors put into docu- ►

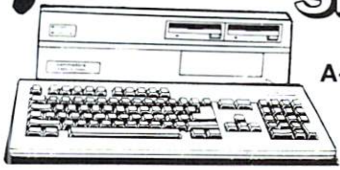
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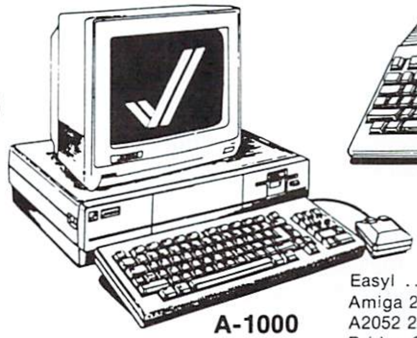
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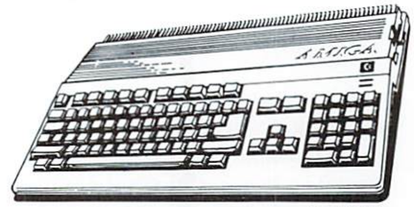
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ments), it can cause headaches later. If you are using a word processor that Promise doesn't recognize, it takes all those funny format strings and turns them into letters that the word processor will no longer recognize as format strings. This means you may have to go through the corrected document, delete all the format strings that have been turned into letters, then reformat the entire document before printing it.

Another minor problem is the way the wild cards work. In a wild card search, Promise looks for at least one or more letters, so if you put in too many letters, Promise will tell you the word is incorrect, but will not be able to suggest the right spelling. If you check a word like "littele," Promise will tell you it is incorrect. If you try to search for litt*le, Promise would give you every word that starts with litt and ends with le but it would not suggest little because it doesn't have enough letters.

Other than these few minor frustrations, Promise works well. It is one of the most expensive spelling checkers for the Amiga, but the extra features like multiple user dictionaries, rudimentary punctuation checking and wild cards may be worth it to you.

—G. Wright

Promise
The Other Guys
PO Box H
Logan, UT 84321
800/942-9402
$49.99
512K required.

PRO VIDEO CG1

A . . . B . . . CG

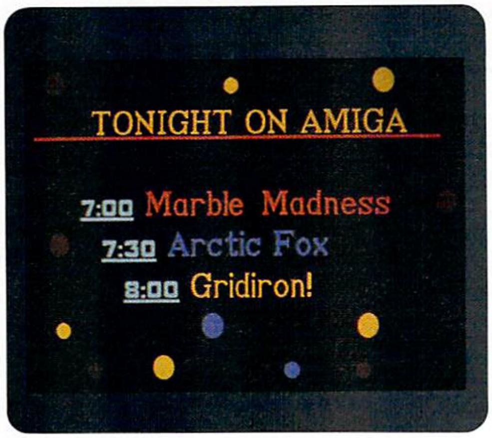
By Joel Tessler

DAY IN AND day out character generators crank out graphics for TV news, sports, weather, commercials, documentaries, entertainment and cable. The power to generate high-resolution fonts, move them around the screen at will and store the pages does not come without a price. Character generators can cost anywhere from $2,500 to $50,000 dollars or more. Low-end character generators lack the ability to do fancy moves like reveals, slides and pulls. They also have smaller font libraries and limited page storage. High-end character generators have very high resolution, some go up to 1,000 × 1,000, but have matching prices.

Enter Pro Video CG1, an affordable high-quality TV titling system for the Amiga. Pro Video CG1 requires a 512K single-drive system with Kickstart 1.1. Amigas with more than one drive *and* extra memory need Kickstart 1.2. A serious problem is that you have to pull your second drive off the system if you don't have extra memory, due to the amount of memory the program's routines require. Despite the limited space, a genlock is optional in both cases.

Touring the Grounds

From the CLI you key in "CG1/prog" for a single-drive 512K system or "execute mem" for multi-drive systems with expanded memory. Text entry is similar to standard word processing, but word wrap is not supported.



Three styles of fonts are available per page, sized small, medium and large. You can combine up to 16 lines of small text, eight lines of medium text and five lines of large text on one page. While Workbench and the mouse were bypassed, effects and editing are streamlined by using the function keys. You move about the screen with the directional arrows, tab, backspace and delete. Some of the more powerful editing features are: duplicate a page, justify, move a line and store a line for repeat. You can store up to 100 pages of crisp hi-res fonts in eight colors with special effects.

The fonts included with the program, such as Roman, Helvetica and Modern Bold, are some of best I have seen on the Amiga to date. Many avoid the unsightly jaggies that producers often complain about. The characters hold together very well in all three sizes. For more variety, JDK Images offers additional font libraries for about $100. When considering costs, keep in mind that you get eight fonts, meticulously rendered as close as possible to broadcast standards. Another option for fonts is character shadowing allowing 13 styles of shadows, including outline, in three sizes of two, four and six pixels. All three fonts are resident in memory after the program is loaded, avoiding annoying disk tasks while rendering text.

The real power of Pro Video CG1 is in its built-in transitions and effects with speed and dwell controls. You've probably seen most of them on television—bang, roll, fade, reveal, pull, wipe, slide, checkerboard and flash. Bang abruptly replaces the current page with the next one. Roll Up vertically scrolls the current page up with the new page following from the bottom. Pull Down rolls down the next page over the current screen. Reveal Up scrolls the current screen up to reveal the next page behind it. Wipe Left replaces the current page by sweeping from left to right. Slide Left pushes the current screen off to the right while pulling the next screen on from the left. Fade causes the current screen to gradually darken and the new screen to fade up from black. Flash is built in to blink words or entire lines.

Across the Border

Pro Video CG1 is not a paint program, however, it does support some graphics. A variety of attractive background grids are available, five styles of vertical, horizontal, diagonal right, diagonal left and squares in 16 sizes. You can generate special characters by using the Alt and a letter key. For instance, Alt-I creates a square. Other special characters produce borders, stars, triangles, circles, etc. Creating graphics in this way is slow, tedious and takes a bit of getting used to. A shortcut is to use the example screens already available on the job data disk supplied with the program. Simply delete the text and write your own over the background. You can easily modify colors in the palette. There are enough different kinds of screens to do just about any job, until you get up to speed using the built-in graphics.

One big disappointment is the program's total lack of IFF compatability, which isolates the program from mixing the Amiga's powerful graphics with text. Nor can you save your work to another format. Pro Video does not seem to share system resources properly, locking out screen-saving and slide-making utilities, such as Gabbit from Discovery Software and the Imprint System from Liquid Light.

Locked on Text

By using a genlock with the program, you can combine any of the previously stored ►

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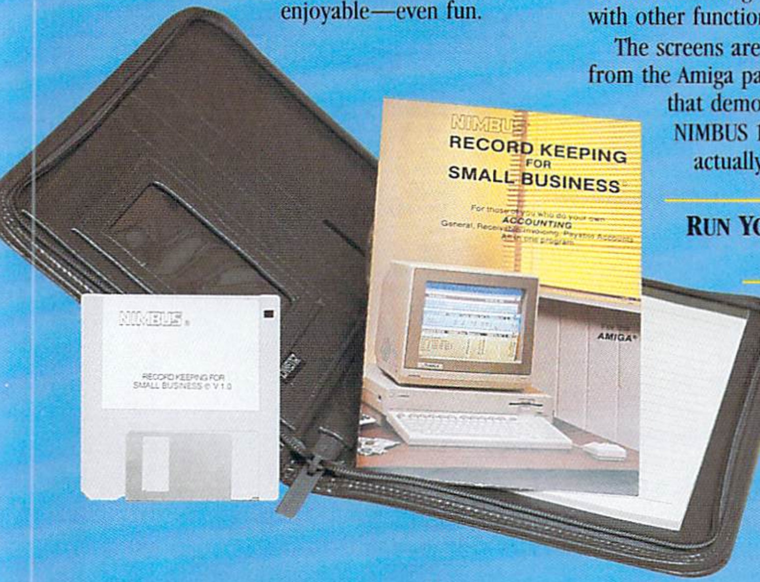
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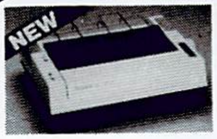
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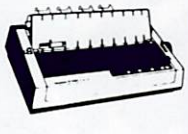


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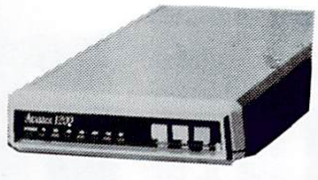
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text pages with an incoming video signal. For instance, you might want to scroll titles over the beginning of a video tape to give it more pizzazz. Having names genlocked over talking heads identifies who you are listening to.

However, I had a problem with previewing. When working with character generators you usually have a preview monitor and a program monitor. The preview monitor displays what's coming from the character generator and the program monitor displays the combined signals of text and video source coming from a live camera or video tape. When your text is positioned and the effect is correct, you press the program key and both are then displayed over the video. The only way I was able to accomplish this was to make a blank page between each screen of text and manually page through them blind. This technique would never work in a live video environment, but for in-house video, it's okay.

The documentation is a good straight forward reference. However, I would have liked a mini-tutorial with examples on how to use the special built-in graphics.

A character generator for the rest of us? Well, maybe. To date I have yet to see anything in the Amiga marketplace with high-quality text and moving effects. There are some programs coming along with text and IFF compatibility, but without the slick transitional moves found in Pro Video CG1. In spite of some problems, Pro Video CG1 is sure to find a niche in cable television, interactive video, in-house video production and more.

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Kickstart Eliminator and RAM Expansion Kit

Kick the Kickstart habit.

By Matthew Leeds

WITH ALL THE bugs lurking in the initial operating system, the advantage of being able to load new versions has proven its worth. However, now that 1.2 is a way of life and 1.3 is a long way off, the time spent loading Kickstart seems wasted. Creative Microsystems Inc. (CMI) has come up with a way to avoid this endless chore with a kit that puts Kickstart into ROM.

The kit includes four EPROMs preprogrammed with Kickstart 1.2, two sockets for the EPROMs, one new Programmed Array Logic (PAL) integrated circuit and socket, miscellaneous connectors, instructions and a disk of utilities. Basically, you take your Amiga apart, replace a few pieces and Kickstart instantly runs when you turn the power on. As a bonus, you gain 256K of RAM. That's the simple explanation.

Surgery

It turns out to be a little more involved. You'll need an array of tools, more than a little time and a lot of patience. After working your way through the cover, the metal shielding and a dozen screws, you're ready to remove the daughterboard, which holds the Writeable Control Store (WCS), the 256K of RAM that Kickstart loads into. Before installing the new PAL chip and jumper on the daughterboard, the original PAL must be desoldered. CMI provides a socket that can be installed prior to soldering the new PAL, which is a good idea in case you ever restore your Amiga to its original condition. According to CMI, the new PAL should work with either an unmodified motherboard or one that has their kit installed.

Once you have the new PAL socket and jumper in position, it's time to move to the main board, which means removing the disk drive, more shielding and screws. First you install two sockets under the area occupied by the disk drive. Commodore uses drives from several manufacturers in the Amiga. Drives made by NEC have a lower clearance than other drives and will not allow the installation of sockets. The solution is to install the new ROM chips directly, so if Kickstart 1.3 is released you'll have to desolder the ROMs to replace them. For the final modification, you cut two traces on the main board and install two jumpers.

Recovery Room

The accompanying diskette contains several programs. The most interesting is ADDMEM, which lets you use the vacant 256K of WCS RAM. Since Kickstart no longer loads into the WCS, you can use it as you would any expansion memory. It does not auto-configure, but by putting ADDMEM on your Workbench and altering your startup-sequence, you can add the memory automatically.

ADDMEM tells the Amiga that more memory has been appended to the system and the addresses for the additional memory. You will need ADDMEM on any Workbench disk you use to boot your machine. If you don't use ADDMEM, your Amiga will be unaware of the extra 256K of RAM and ignore it. Don't worry, programs won't load into the phantom memory and be lost.

To correctly modify your startup-sequence, you'll need a working knowledge of ED or some other text editor. You need only add a single command: ADDMEM 0f80000 0fbffff to the beginning of the sequence. Then copy ADDMEM to the C directory of each disk you modify.

Other utilities include GfxMem, which displays a graphical chart of the amount of chip and fast RAM available and currently in use. You can use it to estimate the memory required by any given program. The RAMOn/Off program is one solution to programs that can't handle expansion RAM. It simply allocates all of the expansion RAM in the system, "filling" the expansion RAM so that graphics or sound data from your other applications cannot load into it. I've found it a convenient way to cure problems with several programs.

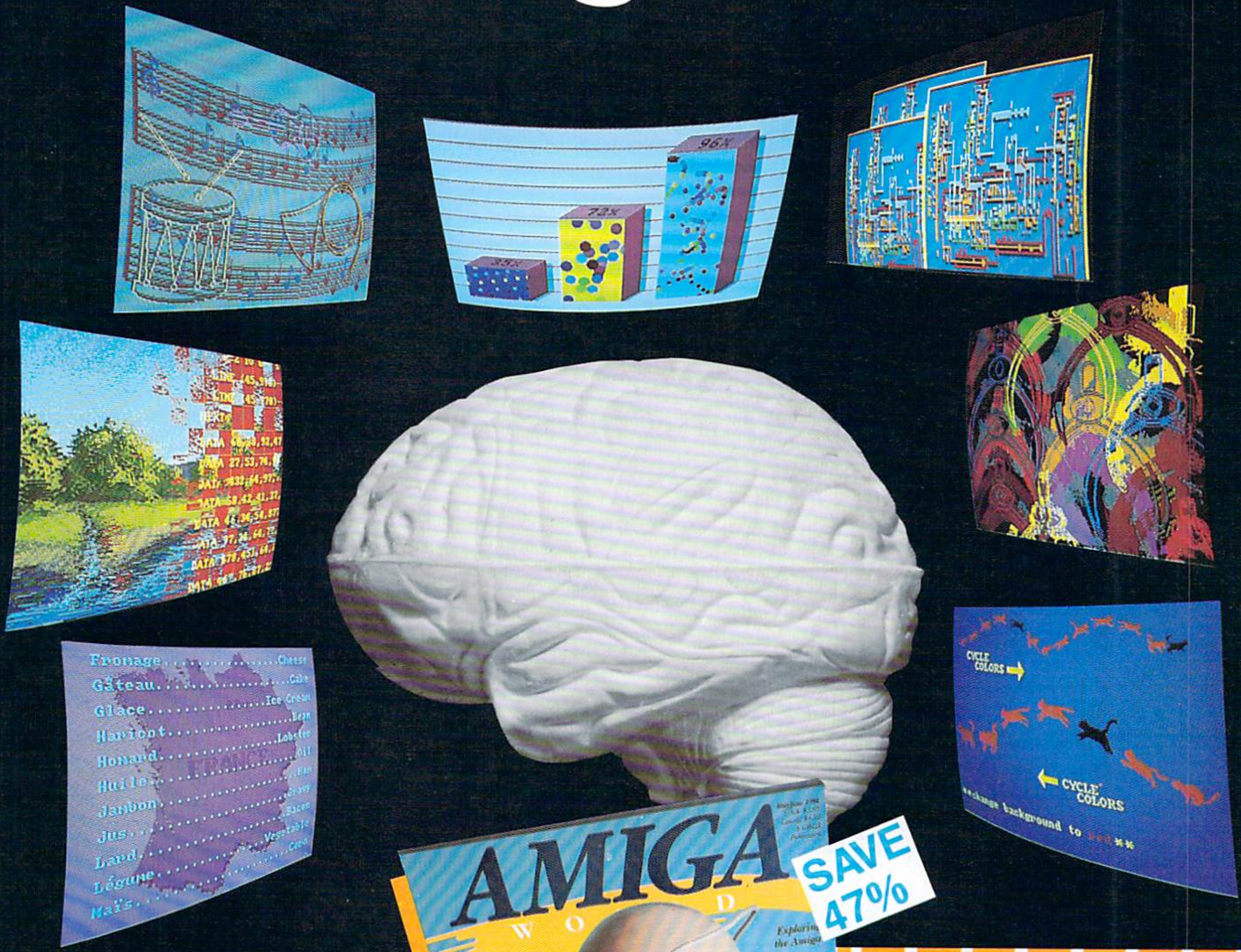
The FixHunk program is a more permanent solution and actually modifies a program to correctly allocate chip memory. By brute force, it searches through a program, locates all references to memory allocation and modifies them to request chip memory. Though not elegant, it works in many cases.

I've successfully patched Textcraft to work with expansion memory. The symptom was disappearing icons; graphic data structures that needed to be in chip memory to be displayed. While FixHunk solved that problem, it also increased the amount of chip memory used since all memory allocations were forced to chip memory.

The Kickstart Eliminator Kit is not a project I would recommend to anyone who has no previous experience working with a soldering pencil and the tools that go along with it. Although the instructions explain the process step by step, they may instill a false sense of confidence in beginners. This is not a project for the inexperienced.

If you turn your Amiga on and off several times a day, are contemplating creating a turnkey operation, are running a BBS or are just lazy, the Kickstart Eliminator may be for you. It works perfectly once installed and provides an additional 256K of RAM at a reasonable price. But consider, installation will void your warranty, and may limit ►

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the ease of use of any new Kickstart and Workbench disks in the future, or any custom Kickstart disks a manufacturer may provide. I've tested it with several hardware peripherals and have found no problems, so I feel that I can safely recommend it.

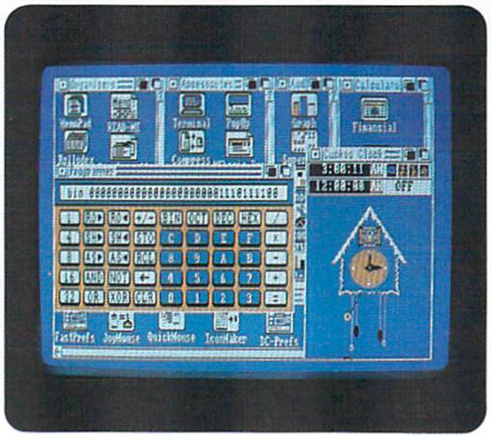
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Installation tools required.

Gizmoz

This set of productivity gadgets could organize even the AmigaWorld *offices.*

By Peggy Herrington

DESKTOP ACCESSORIES are small practical programs that assist you with your primary project or let you use your computer to do things like keep separate lists of names and addresses or dash off memos. They're all the rage in IBM-PC and Apple circles because they provide the illusion of multitasking. Thanks to *real* multitasking, desktop accessories are business-as-usual on the Amiga. One of the simplest yet most



powerful collections is Gizmoz from Digital Solutions. Now in its second version, Gizmoz is dynamite.

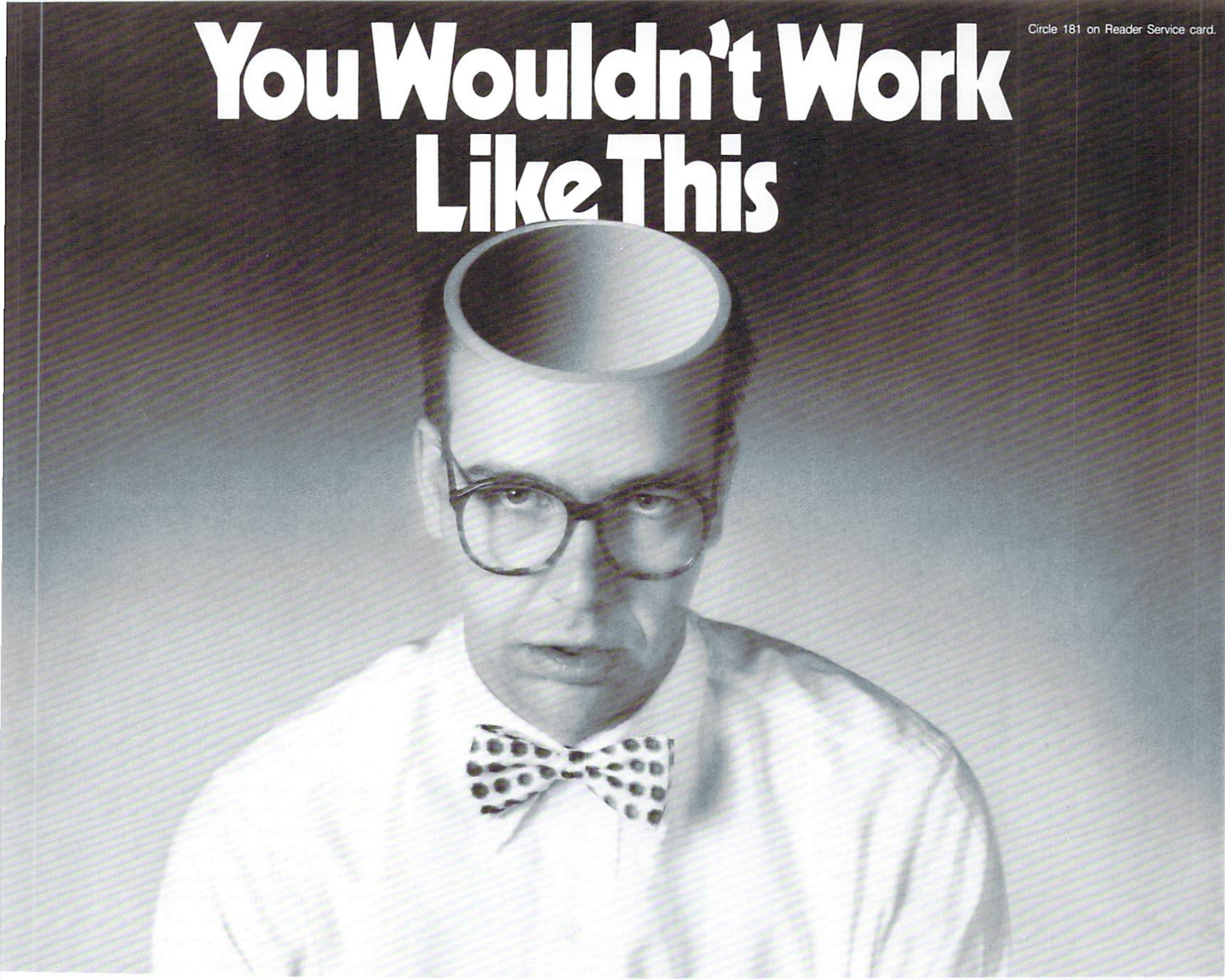
To start any of the 19 programs on the unprotected disk, click on its icon (or on the icon of an associated data file) or implement them automatically via the Startup-Sequence. When not in use, the programs hide with only their titlebars visible. Click on a titlebar and it will expand to the program's input window. Some programs, such as HotKey and QuickMouse, run in silent mode, without even a titlebar.

Gizmoz are deceptively simple and great attention to detail has gone into each one. The Calendar, for instance, displays the month, day of the week and year under which days are arranged like a wall calendar. The difference with this calendar is that it goes from 1900 to 2099 and, for every day in the 200 year span, it offers 50 lines of text to fill with appointments and reminders. By starting a Calendar entry with an asterisk and a time (*10:24pm), the program will remind you of that entry with a repeated beep or flashing screen when the time comes. For more immediate reminders, you can set the CuckooClock alarm to beep or flash the screen. The display is both digital and traditional with a second hand and a little bird that pops out and cries "Cuckoo!". A mouse click silences the ticking. The search feature will locate the time of any appointment.

While each Gizmo is a free-standing program, used together they perform like a ►

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well-rehearsed orchestra. You can paste text from one Gizmo to another without retyping it, so you can move Calendar entires to the MemoPad and Rollodex or vice versa. You can copy a name and address from the Rollodex onto the MemoPad for a letter, or sort, arrange and print any combination of the five lines in Rollodex entries onto real Rollodex cards or fashion lists for mailing labels. The program will also print configurations suitable for inclusion in 8½ × 11-inch or 8 × 10-inch binders.

Other modules work together cleverly, too. The telephone dialing feature in the Rollodex will dial a number listed on an entry through a properly connected auto-dial modem, either for talking or going online with another computer. The Terminal communications Gizmo features ANSI, TTY, VT100, ADM-3A emulations with Xmodem, Simple Modem and AmigaBinary protocols and a virtual text buffer. With the powerful HotKey Gizmo, you can create macros for dialing, log-on or navigational commands. Every key on the keyboard can be programmed four ways with HotKey macros. However, you must take care not to set-up a HotKey combination that overrides those used by a program you are running.

You can save different data file sets of HotKey macros (or Rollodex entries, etc.) and load them in when needed. Should you forget the details, the PopUp Gizmo lets you make reference notes that pop onto the screen at the press of a key. The scientific, financial and programmer calculators will fill most of your math needs. Graph displays number-based data in bar, column or pie graphs of 12 changeable colors. You can then print them on paper or save them in IFF format to disk.

Because system response will slow if you run several programs simultaneously, you can arrange the programs' priorities (so that what you want done first gets the most attention) with SetPriority. Announce reads aloud text files or words you type, automatically translates English to phonemes and lets you fiddle with voice parameters. You can Encrypt data files with a secret password, and compress them to take less disk space or online transfer time. Or, you can plug in a standard joystick and use it or the mouse with JoyMouse. Should you need a program icon, IconMaker will help you create all the different types that the Amiga uses.

The manual, which is very well done and easy to read, suggests other ways to use Gizmoz, including a fascinating game called SuperLife. Gizmoz can be used in any combination (memory permitting) and with any program that will multitask. Gizmoz are the epitome of multitasking and I can't think of software I'd more heartily recommend for novices and power-users alike.

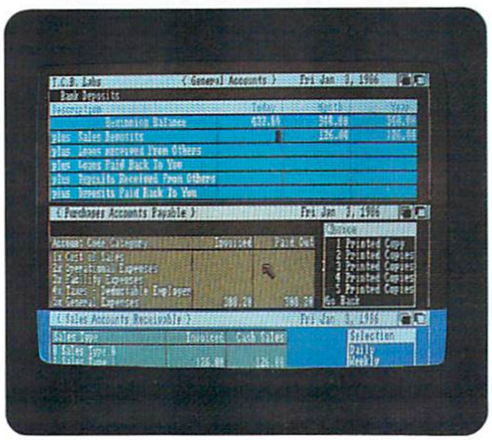
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Record Keeping for Small Business

Make a break with tradition and try cash-based accounting.

By Sandra Cook Jerome

MOST SMALL business owners find accounting and cash management a daily headache. Record Keeping for Small Business by Nimbus is a revolutionary cash-oriented accounting program for the non-accountant. Although those familiar with standard accounting systems will have a



very difficult time adapting, the small business owner who has not been able to master accounting might find this program manageable.

Each module is a different color and layered on the screen for easy access between the General Ledger, Accounts Receivable and Accounts Payable. Data is stored on the program disk, which holds a combination of about 400 vendors and customers, with space for approximately four open invoices per account. The program is meant to operate from the internal drive only, but Nimbus will update your copy to run from an external or hard drive if necessary.

Printing is done "in the background," allowing you to continue working on your books while generating reports. Most reports print to the screen, allowing you to save time and paper for a simple inquiry. All but the annual summary output to a printer. Some of the balance sheet's account names, such as "Deposits You Made to Others," may seem unprofessional on a financial statement. You cannot change these titles, but you can alter most sales and expense accounts.

When posting checks or invoices, pop-up windows display a listing of customers or account numbers for easy selection. The invoices have a choice of terms, discounts and the option of adding a "ship to" address. Invoices total automatically, figuring the extended price, adding shipping and sales tax for a grand total. Plenty of room is left over for the item description. You can apply each item to 10 different sales categories and specify if it's taxable. Anyone who has to provide an extensive invoice with taxable and non-taxable items could benefit. As long as customers are usually only billed once, the business shouldn't be harmed by the program's lack of statement generation.

When a program deviates from the norm so dramatically, features you might ordinarily expect to find are often missing. For example, Accounts Receivable does not update the General Ledger until the payment is received. While in this module, an invoice is entered and saved, but no sales amounts are recorded. Later, when a payment is made, the invoice is edited to show a payment was received and the cash account automatically increases. Again, there is no option for statements; instead, the customer's account status is printed at the bottom of each invoice as a friendly reminder of previous invoices that might be due. Oddly, the account aging information that is displayed omits any numbers to the right of the decimal. The balance due is truncated, not rounded, to even dollars.

The Accounts Payable module operates as a mirror to the Receivables module, updating the General Ledger as payments are made to vendors. The method of entering bank deposits in the General Ledger is a little confusing, however, since any amount deposited in excess of sales receipts is credited to Paid-In-Capital.

Can't Get There from Here

One potentially serious problem is the way the program stores information. At the close of each session, the End-Of-Day rou-

tine *must* be run in each module to update your files. While the program constantly writes to the disk during data entry, the indicies by which each module finds stored data are held in memory. If you have a power failure prior to running this option, the day's work would be lost. Even though the new transactions are on disk, the program cannot access them.

It would be very easy to criticize this program's lack of conformity to accepted accounting principles, but the title is Record Keeping for Small Business, not *Accounting* for Small Business. Many business owners have no desire to do their own accounting, instead they just want to track sales and expenses using the familiar cash method. If you don't mind trying something new and don't require professional style financial reports, this program is worth a try.

Record Keeping for Small Business
Nimbus Corp.
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$149.50
512K required.

dBMAN

This database features dBase compatability and a few surprises.

By Ted Salamone

DATABASE MANAGERS like VersaSoft's dBMAN allow you to collect, categorize, manipulate and analyze information. A good database makes it easy to enter, edit, manipulate and retrieve anything from a collection of baseball cards to a list of business clients. A poor database is difficult to use and lacks subtle but important features; a bad one is a silicon nightmare.

The First Crack Appears

After I reviewed the well organized, though not too Amiga-specific manual, dBMAN, ported from the IBM PC, held a lot of promise—a fairly high level of compatability with DBASE II and III, an impressive report generator, speedy record indexing capabilities and a truly relational environment. Features include multiple levels of on-line help, a copyable master disk, a no-fee runtime version for developers and liberal or non-existent limits on the number of databases, record sizes and file sizes.

This looked like an otherwise good start for a program that apparently had no Amiga interface, just a CLI-like command line. That's when the three update sheets came into play. Besides some operating tips and load instructions, there was mention of an Assist overlay, a pull-down menu shell built around dBMAN allowing use of a mouse. Great!

Not so great. Even under Kickstart 1.2, dBMAN does not autoboot; instead, you must enter a few lines through the CLI—definitely not transparent and hardly user friendly. The updated load instructions for 1.2 are wrong. Failure after failure resulted with dBMAN crashing back into DOS—locked up completely. A warm reboot was the easiest way to get the CLI operational again. After a lot of frustration I mixed and matched the old instructions with the new and finally got the application to run. The new instructions left out the STACK 9000 command.

Up and Running?

Once seemingly secure, I set about creating a database to organize my software by CPU, Title, Class and Publisher. After loading the Assist overlay, I assumed there would be no more Command Line typing. Assist is like a stick shanty built atop an active volcano. The simplest things send it crashing into dBMAN's command line where multiple entries of the Clear command are needed before you can try again.

Other supposedly routine requests crashed both Assist and dBMAN into oblivion. To make matters worse, my database was unusable. It was on the disk, but the program was unable to access it.

Flexible and Speedy?

Strictly using Command Line input, I built another database. My test file was up to 76 records despite another two crash-and-burns. At one point I changed the field name Class to Type and found out that Type is a reserved word. The notification wasn't polite either. The database locked up, dBMAN locked up—another flamer.

Back to Class and a successful indexing by CPU and Class. Successful but not exactly speedy. Since indexing is supposed to be much faster than sorting, I gave sorting a try. While both put me to sleep, indexing only made me drowsy. A full sort sent me into Rapid Eye Movement. (Imagine a 2,000-record sort, if sorting 76 records ►

Hors d'oeuvres

Unique applications, tips and stuff

You may be using your Amiga at work, at home, or in the back seat of your car, but somehow you'll be using it in a unique way. You will discover things that will let you do something faster, easier or more elegantly.

AmigaWorld would like to share those shortcuts, ideas, things to avoid, things to try, etc., with everyone, and we'll reward you with a colorful, appetizing, official *AmigaWorld* T-shirt. (Just remember to tell us your size.)

Send it in, no matter how outrageous, clever, humorous or bizarre. We will read anything, but we won't return it, so keep a copy for yourself. In cases of duplication, T-shirts are awarded on a first come, first serve basis.

So, put on your thinking berets and rush those suggestions to:

Hors d'oeuvres
***AmigaWorld* editorial**
80 Elm Street
Peterborough, NH 03458

takes over a minute.)

As for flexibility, you cannot change data disks. Data must be stored on a single floppy. Once the limit is reached, you must create (or copy) an exact duplicate of the database to continue. Of course you cannot consolidate mailings, statistics or reports across disks. This only applies to large databases; however, dBMAN is targeted for heavy business use.

The Dam Bursts Wide Open

Setting the default drive to DF1: via the Assist overlay worked—on occasion. Other times it produced "Error 63 INSTK POPPING, Please report the problem to VersaSoft." Trying the Display Files command caused Guru 3.00024EB8. After a cold boot the same command caused Guru 3.000251EO. These are just some of the reproducible errors. Most of these problems disappeared after the right Stack command was issued at startup. One problem that didn't go away was the program's inability to properly handle basic system requests.

During the test, I swapped data disks in the external drive. dBMAN asked for the other one back. After replacing the original, I clicked the system request box and wound



up back in an inoperative CLI window, repeatedly. My database was again impossible to access. There is no excuse for such poor exception/error handling. According to VersaSoft's tech support, the problem is with AmigaDOS, not dBMAN. Other programs work well with AmigaDOS, so why doesn't dBMAN?

On the subject of tech support, the one full-time Amiga-specific person didn't even know how to access the CLI before Workbench finishes loading. I posed as an ordinary user who had just bought the package, and he was unable to successfully answer one of my questions. He did tell me that you can't swap data disks, however.

With the database entered, I was ready to produce a report. Or so I thought. Seems the report generator (RPRTI.DBM) wasn't on the disk. When the backup I requested from VersaSoft arrived, what a surprise; it had the same incorrect startup instructions, same fragility and still no report generator.

Stop The Presses

In the final hour before my review deadline, VersaSoft issued an update to Version 3.00. I checked it for new problems, known problems and the report generator. (Yes, they finally shipped it.) The Stack 9000 command is still needed, but not noted—anywhere. Error handling is still abysmal, though fewer conditions cause the system to crash into CLI. However, opening a database with the disk's write-protect tab on caused a system requester identifying the situation. After moving the tab, I clicked on Reset—nothing. Selecting Cancel evoked Guru error 3.0000A708. After rebooting (with the tab in write OK position), a requester identified a task held error. (This also happened before.) Once again Guru 3.0000A708 was the only way out. ►

The Assist overlay has taken on some interesting twists. When creating a sort, I chose a name that already existed. The system told me so, then crashed out of the Assist overlay saying "Command Name is Illegal." I didn't issue any commands, only entered a file name. At times the Assist gadgets appeared dead; numerous mouse clicks produced no apparent activity. Then, without warning, the commands would leap into action. If they didn't, it was reboot time.

The long-awaited report generator proved to be less than intuitive. You must enclose headers, footers, etc. (but not field names) in quotation marks when creating a report format. Dates must be in parentheses. The fill-in-the-blank report-generation system prompts you for the type of entry (text, database field name or date), but doesn't understand your responses. Nor does it provide any help. After specifying the sort or index file to work with, you must still identify each field by name—exactly as spelled in the database. While dBMAN has point-and-click recall for creating indices and sorts, it doesn't for reports. If a field name is incorrectly entered the program notifies you and promptly locks up. Time to reboot.

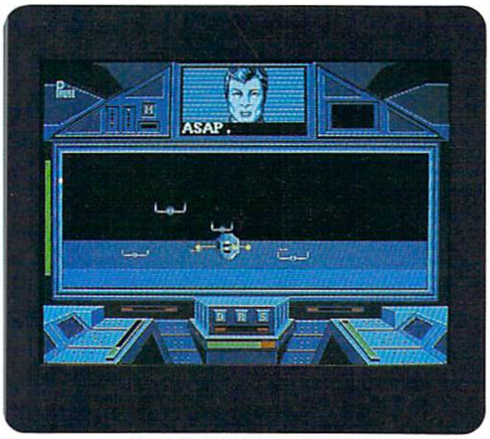
The blatant problems have been corrected, some in the right way, some in a kludgey fashion. If anything, dBMAN has more subtle, more insidious problems; the kind where users think they are at fault—not the program. With the update, dBMAN has risen in my opinion from a silicon nightmare to a persistent bad dream.

dBMAN
VersaSoft Corporation
4340 Almaden Expressway, Suite 250
San Jose, CA 95118
408/723-9044
$199.95
512K required.

Game Shorty

SDI

Like Defender of the Crown, Mindscape's first Cinemaware release, SDI makes superb use of the Amiga's graphics and music capabilities. Unlike Defender, which sets you in the medieval past, SDI projects you into the



near future, charging you with nothing less than the defense of North America. KGB rebels are staging a coup against the Soviet government, threating to tear down America's satellite defense system and blow everything up. As if this weren't anxiety-inducing enough, your Russian lady love is trapped aboard the hijacked Soviet space station. Your mission is simple: save the world and save the girl. Pure space opera, and corny at that.

You have several duties to perform. Inside your space fighter, you shoot down KGB fighters and repair SDI satellites. Eventually the KGB will claim U.S. aggression and launch missiles, at which point you have two minutes to dock with your space station (no mean feat) and destroy the missiles before they can demolish U.S. cities. Four times through this procedure and you can attempt to rescue your lady aboard the Soviet station. Succeed at this, and you win the game. You also win a heartwarming kiss.

It all sounds interesting, and for a while it is. But like Defender of the Crown, SDI quickly grows tedious. The problem is that none of the individual game functions are enjoyable, at least not in the long run. The fighter sequence is a straight shoot-'em-up, the missile sequence is far too reminiscent of Atari's old Missile Command and the Soviet space station is laughably primitive. The pictures are gorgeous, and the music is both entertaining and unobtrusive, but the game play is unimpressive. SDI is an excellent Amiga show-piece, but, as a game, it has a long way to go. (*$49.95, Mindscape Inc., 3444 Dundee Rd., Northbrook, IL 60062, 312/480-7667. 512K required.*)

—Neil Randall ■

Help Key

By the flickering light of an interlaced screen, Bob hunched over The Book of Knowledge, delving into the Amiga's secrets to bring enlightenment to his disciples.

By Bob Ryan

Shake, Partner

Q: I own an Amiga and an Apple Imagewriter II printer. I have been very happy with the output of the printer except for two problems. First, when printing text in Near-Letter Quality mode, I have to lower the baud rate from 9600 to 1200 or 300 to avoid jumbled characters towards the end of the page. How can I avoid this problem so I can use the higher baud rates?

My second problem concerns printing graphics. Vertical lines take on a jagged look due to the Imagewriter II's bidirectional printing. Is there a hardware fix to stop bidirectional printing? The manual lists an escape code that turns off bidirectional printing; how do I send the code every time I want to print graphics?

Doug Wilson
Parowan, UT

A: Since your Imagewriter II does print characters correctly until the end of a page, and since slowing the rate of data transfer to the printer corrects the problem, I suspect that you're not using the same interface protocol for your printer and your Amiga. Consequently, things get jumbled after you fill up the Imagewriter's data buffer. To correct the problem, set up the serial port in Preferences to use Xon/Xoff protocol. Then, set DIP switch SW2-3 of the Imagewiter II to the closed position. With both your Amiga and your printer using the same protocol as well as the same baud rate and data word, your printer should work fine at higher baud rates.

Unlike the communications protocol, you can't change from bidirectional to unidirectional printing by changing a DIP switch. You have to send the proper control code (Escape >) before printing. You can send the escape code in many ways. One is to write a short program in the language of your choice that sends the escape code to the SER: device (not the PRT: device). By running such a program from a background CLI before you print graphics, you can easily set the printer to work from left to right only. If you're not a programmer, you can send the code manually from a background CLI. First, redirect output to the SER: device by typing > SER: and hitting the return key. Next, enter the Imagewriter code for unidirectional printing by hitting the escape key, then the greater-than key and return again. Finally, redirect output back to the screen by typing > CON: and return. As long as your graphics dump program doesn't send the reset code to your printer before printing, you should now get your graphics printed in unidirectional mode.

Window Currents

Q: I've been trying to construct a program using Amiga Basic and I'm having problems with the INPUT and LINE INPUT statements. When I run the program, the prompt strings print okay and the cursor moves to the proper location, but the program won't accept keyboard input. When the first key is struck, the screen flashes and the program doesn't get the keystrokes. Any help?

E. A. Morris
Sparta, NJ

A: Your problem stems from the fact that you can't input into a window unless the window has been previously selected. To select a window, you have to click inside the window with the left-mouse button. Amiga Basic doesn't have a function that lets you determine the selected window from inside a program; however, the first window you open on a custom screen you've defined will automatically be the selected window.

Note that the selected window and the current window don't have to be the same. The current window is the one where program output is sent. It is normally the top window on the screen but you can make a window current without moving it to the top by using the WINDOW OUTPUT statement.

More Amiga Hardcopy

Q: The May/June 1987 Help Key carried a letter from David Miller requesting information about a variety of output media for his Amiga picture files. Our company, ExpressIt, uses the Imprint/Polaroid Palette system. We produce 35mm slides of Amiga pictures for $7.50 and Polariod instant prints for $3.50 (eight picture minimum). We can also handle IBM picture files. Readers can contact us at 2601 E. Victoria Street, Compton, CA 90220, 213/632-4867.

Paul D. Ryan
Compton, CA

A: Thanks for the information, Paul. Any companies providing products or services to the Amiga community can get free publicity by sending a description of the product to What's New?, *AmigaWorld*, 80 Elm Street, Peterborough, NH 03458.

Kickstart Eliminator Revisited

Last issue, I expressed reservations about the Kickstart Eliminator and RAM Expansion Kit from Creative Microsystems Inc. (reviewed this month on page 80). While preparing this installment of Help Key, I got a call from the folks at CMI who gave me more information about the product. According to CMI, you won't encounter any memory conflicts between the WCS (Writable Control Store) RAM and expansion RAM at $200000 or CPU RAM at $C00000 because Kickstart Eliminator adds the WCS RAM to an unused area of the Amiga memory map, namely the one-half of the 512K space reserved for system ROM that isn't currently used by Commodore. As it is unlikely that Commodore will ever release a version of the operating system that uses all 512K of ROM, you can rest easy that using Kickstart Eliminator will not cause conflicts with other memory devices.■

Parlor Tricks and ARC

With a little effort, and a modem, you can get free or shareware programs that will bring out your Amiga's best.

By Peggy Herrington

HUNDREDS OF Amiga programs are available on networks and electronic bulletin boards, thanks to the devotion of many ingenious and creative Amiga programmers.

Most of these programs are eminently practical, but a body of delightful Amiga "parlor tricks" is building online, sparked by inspired programmers like Leo Schwab (who solicits job offers with his contributions). PING, ING, OING, ZOING!, YABOING, FILL, MELT, TILT, SCAT!, DK, LPEM, and my favorite, ROBOTROFF, show off Amiga features and will provide you with hours of fun.

Look Before You Download

Public domain and shareware programs don't, however, come with printed manuals, and you'd better understand some things before you fire up your modem. They often consist of individual files with operating instructions (README, Poster or .doc files), program icons (.info files), sometimes source code that can be altered and compiled (.c and others) and, of course, executable programs (occasionally with .exe extensions). Before being put online, these files are grouped together and compressed so that they're quicker (and therefore less expensive) to transfer.

When this is done with a shareware utility program called The ARChive Utility ("ARC" for short), the resultant file is given an .arc name extension and called an ARCed file. ARC works both ways: given appropriate commands, it collects and compresses *or* separates and extracts files. A portion of ARC—known as UNARC—was extracted by D. J. James of PeopleLink. UNARC will only decompress and extract ARCed files. Beyond convenience and a 20- to 80-percent reduction in bulk, ARCed files offer the advantage of being unaffected by Xmodem padding. You don't have to trunc, chop or strip them.

But speed and convenience have their price, and while ARCed files may be downloaded normally, you're out of luck if you don't have ARC or UNARC on disk and know how to extract component files from the CLI. It isn't *that* hard, given an AmigaDOS book and Enhancer V1.2 Kickstart and Workbench manual. All the parlor tricks are ARCed. Here's how you'd handle ROBOTROFF.ARC for instance:

1. Download ARC.EXE (or UNARC.EXE) and ROBOTROFF.ARC to a previously initialized disk.
2. Sign off and quit your terminal program.
3. From the CLI, direct the system to that disk using CD DF0: or CD DF1: depending on which drive it's in. LIST to make sure both programs are there.
4. Type RENAME *<whatever-you-called-ARC.EXE>* AS ARC or RENAME UNARC.EXE AS UNARC. LIST again to make sure it worked.
5. Type ARC X ROBOTROFF (the .ARC extension is optional, but you must type the first part of the name exactly as it appears on your disk). If you got UNARC, type UNARC ROBOTROFF.
6. Watch *10* files being extracted onto your disk.
7. Type ROBOTROFF and wait a few minutes for the fun to start.

Comparing ROBOTROFF.ARC with the extracted files reveals a savings of nearly 50 percent in size and transfer time. It's actually greater because you don't have to fool with 10 downloads. After I located ROBOTR.ARC on CompuServe (that's what it's called there), it took about six minutes to download it using Online! at 1200 baud with CIS-B protocol. That's $1.28.

Once you've got this down, learn to copy files to RAM: temporarily when moving them from disk to disk, and to create disk directories to store them in tidy groups. TYPE *<filename>* will print a text file to the screen, and an EXECUTE.ME file is redundantly executed with EXECUTE EXECUTE.ME. ARC instructions will print to your screen when you simply type the name of your ARC program by itself, but they don't mention two things that can foil you: ARC and the ARCed file must be together on an "open" disk or inside the same directory, and file names must be typed exactly as they appear on disk.

Everyone loves ROBOTROFF, so I won't spoil your fun by telling you what it does. It's widely available and ARC instruction files are online, too. In CompuServe's AmigaForum, ARC.EXE (.EXE means a file requires no processing once it's downloaded) and ARC23.DOC are in Data Library 4. ARC.HLP (a help file) is in DL 1, and parlor tricks are located with BRO/KEY:HACK in DL 10. In GEnie's *StarShip* Amiga, file #2089 is an ARCHELP file, #2087 is UNARC and #1726 is ARC023.ARC—the most recent version as we go to press.

Parlor tricks are in the Graphics Thingies library. In PeopleLink's AmigaZone, type / LIB;QSCAN;KEY SCHWABIE to find parlor tricks. ARC.EXE is in Section 4 along with UNARC.EXE. If you put UNARC (renamed) in your Workbench C directory, you can set the system path to the directory of an ARCed file using CD, and type UNARC *<filename>* to extract it without copying ARC from disk to disk.

The CLI Advantage

There are many shortcuts, but any way you cut it, unARCing requires a working knowledge of the CLI. Beyond the cost of connect-time fees to transfer public domain files, some programs like ARC are shareware, meaning the author requests a contribution if you find it useful. If you like ARC, send a contribution (maybe five bucks?) to Raymond S. Brand at 503 Rowland Road, Fairfield CT 06430. ■

Hors d'oeuvres

Unique applications, tips and stuff

You may be using your Amiga at work, at home, or in the back seat of your car, but somehow you'll be using it in a unique way. You will discover things that will let you do something faster, easier or more elegantly.

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So, put on your thinking berets and rush those suggestions to:

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What's New?

Play a few games, publish a magazine, call a network (or start one), animate a cartoon or give your mouse a bath.

Compiled by Linda Barrett

Polly Want A . . . Modem?

Novation Inc. has something to squawk about—the **Parrot 1200** modem. Fully Bell 103/212A hardware and Hayes-compatible, the unit runs at 300 or 1200 baud and relies only on power from the host computer's RS232 serial port. The Parrot 1200 remains in a wait state until it detects activity, then switches on to the required mode. About the size of an audio cassette, the modem features an asynchronous data format, full duplex operation, touch tone and pulse dialing, automatic answer, detection of busy, ringback, MCI and SPRINT tones and a speaker with volume control. Besides a self test, the Parrot 1200 will test analog loop-back, local digital loop-back and remote digital loop-back. The modem alone retails for $119; for $135 you also receive cables and Amiga software. A two-year warranty is standard. For more information, contact Novation Inc., 21345 Lassen St., Chatsworth, CA 91311, 818/998-5060.

Top Secret

Not even the Rosetta Stone could help you crack the **MagiCode Encryption System.** Magic Circle Software's latest release will encrypt text, program source code, schematic drawings, pictures from a paint program or executable code from a compiled program. If you're using a modem, MagiCode will protect your data before, during and after transmission. Or, you can use the program to lock various portions of a file, providing multiple access levels for classified information. The non copy-protected program lists for $30 and is available from Magic Circle Software, 37 Raldne Road, Hyde Park, MA 02136.

What Would Mickey Say?

Animator: Apprentice from Hash Enterprises uses Disney-style animation to create three-dimensional characters in full color and shading. The Sculpt mode combines two different two-dimensional silhouettes of an object into a single 3-D sculpture. You can link objects into characters, define their movements and save the actions in libraries for later use. The Director module lets you position characters on stage, detail their scripts, control the camera's movement and focal length, set the light source and preview the results in real-time. The program creates animation frames one at a time, taking between five and 20 minutes. With a genlock, you can mat backgrounds onto your creations. Animator: Apprentice sells for $295, demo disks are $5. Direct your inquiries to Hash Enterprises, 14201 SE 16th Circle, Vancouver, WA 98684, 206/256-8567.

Playwrights and Publishers

After all these years of reading Shakespeare, you can finally put him to work. **Shakespeare: The Page Integrator**, new from Infinity Software, is a non copy-protected desktop-publishing system with built-in Postscript support. Besides the standard text-related functions, Shakespeare offers color IFF compatibility, letting you import, resize or superimpose color graphics and fonts. All elements of the display are constantly updated, so you won't have to wait for the whole screen to recalculate everytime you change a layout. If you're faced with a creativity block, the package also includes graphic design templates and a library of digitized clip art. The two-disk set sells for $225 and is available from Infinity Software Ltd., 1144 65th St., Suite C, Emeryville, CA 94608, 415/420-1551.

Run Silent, Run Deep

Clear the decks and prepare to dive into World War II with **Silent Service**, the submarine simulation from MicroProse. You command an American submarine in the South Pacific, searching out and attacking lone Japanese ships and well-escorted convoys. Once the enemy is sighted, you can go up to the bridge, track his movements through the periscope, check your gauges (fuel, battery, remaining bow and aft torpedos, remaining shells, time of day, depth) or study one of the four maps. If the destroyers find you first, you may have to check the sub's schematic for damage reports. Your rank is determined by the level of difficulty of your mission and the number of tons you sink. The enlistment fee is $39.95. Contact your local recruiting office or MicroProse, 120 Lakefront Drive, Hunt Valley, MD 21030, 301/771-1151.

Two Golden Ideas

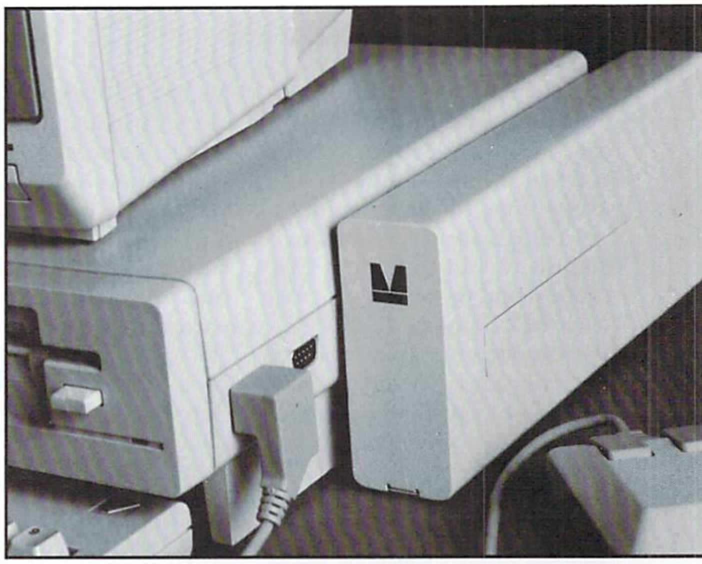
Take a gold disk, add a laser, and what have you got? Not a high-end Compact Disc player, but Postscript support for Gold Disk's entry-level desktop-publishing program, PageSetter. **LaserScript** lets you output your PageSetter documents to any Postscript-compatible laser printer, and provides special effects such as page rotation, scaling and translation. You can even import several PageSetter documents and output them to ►

AVAILABLE NOW!

StarBoard2

If you've owned your Amiga® for a while now, you *know* you definitely need more than 512k of memory. You probably need *at least* double that amount...but you might need as much as an additional two megabytes. We want to urge you to use **StarBoard2** as the solution to your memory expansion problem –and to some of your other Amiga-expansion needs as well!

Auto-Configuring Fast RAM
Zero Wait States
User Expandable from 512k to 2 Megabytes
Bus Pass-Through
MultiFunction Option: battery/ clock, FPU, parity, Sticky-Disk



It's small, but it's BIG–

Since most of you want to expand your Amiga's memory without having to also expand your computer table, we designed **StarBoard2** and its two optional "daughterboards" to fit into a sleek, unobtrusive Amiga-styled case that snugly fastens to your computer with two precision-machined jackscrews.

The sculpted steel case of **StarBoard2** measures only 1.6" wide by 4.3" high by 10.2" long. You can access the inside of the case by removing just two small screws on the bottom and pulling it apart. We make **StarBoard2** easy to get into so that you or your dealer can expand it by installing up to one megabyte of RAM on the standard **StarBoard2** or up to two megabytes by adding in an Upper Deck.

This card has decks!

The basic **StarBoard2** starts out as a one megabyte memory space with 0k, 512k, or one megabyte installed. If you add in an optional **Upper Deck** (which plugs onto the Main Board inside the case) you bring **StarBoard2** up to its full two megabyte potential. You can buy your **StarBoard2** with the Upper Deck (populated or unpopulated) or buy the Upper Deck later as your need for memory grows.

And you can add other functions to **StarBoard2** by plugging in its second optional deck –the Multifunction Module!

StarBoard2: functions five!

If we count Fast Memory as one function, the addition of the **MultiFunction Module** brings the total up to five!

THE CLOCK FUNCTION:

Whenever you boot your Amiga you have to tell it what time it is! Add a MultiFunction Module to your **StarBoard2** and you can hand that tedious task to the battery-backed, real-time clock/calendar. A small piece of MicroBotics software in your WorkBench Startup-Sequence reads the clock and automatically sets the time and date in your Amiga. And the battery *is* included (we designed it to use an inexpensive, standard AAA battery which will last at least two years before needing replacement).

THE FLOATING POINT FUNCTION:

If any one aspect most characterizes the Amiga it's *fast* graphics! Most graphic routines make heavy use of the Amiga Floating Point Library. Replacing this library with the one we give you with your MultiFunction Module and installing a separately purchased Motorola 68881 FPU chip in the socket provided by the Module will speed up these math operations from 5 to 40 times! And if you write your own software, you can directly address this chip for increased speed in integer arithmetic operations in addition to floating point math.

THE PARITY CHECKING FUNCTION:

If you install an additional ninth RAM chip for every eight in your **StarBoard2**, then you can enable *parity checking*. Parity checking will alert you (with a bus-error message) in the event of any data corruption in **StarBoard2**'s memory space. So what good is it to know that your data's messed up if the hardware can't fix it for you? It will warn you against saving that data to disk and possibly destroying your database or your massive spreadsheet. The more memory you have in your system the more likely it is, statistically, that random errors will occur. Parity checking gives you some protection from this threat to your data residing in Fast RAM. Note that the Amiga's "chip" RAM cannot be parity checked.

THE IMMORTAL MEMORY DISK FUNCTION (STICKY-DISK):

When you've got a lot of RAM, you can make nice big RAM-Disks and speed up your Amiga's operations a lot! But there's one bad thing about RAM-Disks: they go away when you re-boot your machine. Sticky-Disk solves that problem for you. It turns all of the memory space inside a single **StarBoard2** into a Memory Disk that will survive a warm-reboot! When your Amiga attempts to grab a **StarBoard2** in Sticky-Disk mode, a hardware signal prevents the system from acquiring the **StarBoard2** as FastRAM (and thereby erasing your files) –instead it is re-recognized as a Memory Disk and its contents are preserved intact. If you want to work rapidly with large files of data that are being constantly updated (such as when developing software) you can appreciate the Sticky-Disk!

Fast RAM –no waiting!

StarBoard2 is a *totally* engineered product. It is a ZERO WAIT-STATE design, auto-configuring under AmigaDOS 1.2 as Fast RAM. Since AmigaDOS 1.1 doesn't support autoconfiguration, we also give you the software to configure memory in 1.1.

Any applications software which "looks" for Fast RAM will "find" **StarBoard2.** And you'll find that your applications run more efficiently due to **StarBoard2** on the bus.

A passing bus? Indeed!

What good is an Expansion Bus if it hits a dead end, as with some memory cards? Not much, we think –that's why we carefully and compatibly passed through the bus so you could attach other devices onto your Amiga (including another **StarBoard2**, of course!).

The sum of the parts...

A really nice feature of the **StarBoard2** system is that you can buy exactly what you need now without closing off your options for future exapansion. You can even buy a 0k **StarBoard2** (with a one megabyte capacity) and populate it with your own RAM (commonly available 256k by 1 by 150ns memory chips). When you add **StarBoard2** to your Amiga you have a powerful hardware combination, superior to any single-user micro on the market. See your Authorized Amiga Dealer today and ask for **StarBoard2**

SUGGESTED RETAIL PRICING:	
StarBoard2, 0k (1 meg space):	$349
StarBoard2, 0k (2 meg space):	$395
StarBoard2, 512k (1 meg space):	$495
StarBoard2, 1 meg (1 meg space)	$595
StarBoard2, 2 megs installed:	$879
StarBoard2, 2 megs & MultiFunction:	$959
Upper Deck, 0k (1 meg space):	$ 99
MultiFunction Module:	$ 99
also available:	
Standard 256k memory card:	$129
MAS-Drive20, 20 meg harddisk:	$1495
MouseTime, mouseport clock:	$ 50

MicroBotics, Inc.
811 Alpha Drive, Suite 335, Richardson, Texas 75081 / (214) 437-5330

Circle 103 on Reader Service card.

a single page, assigning priorities to the various images and pages. Courier, Helvetica, Times and Symbol fonts are supported in eight, 12, 16 and 24 point.

For the more serious desktop publisher, Gold Disk offers **The Professional Page**. The program features a complete WYSIWYG word processor, algorithmic and discretionary hyphenation, automatic and manual kerning, absolute, relative and automatic leading, font sizes of up to 127 points, bold, italic, underline, outline and shadow text styles. You can import text from Scribble!, Textcraft, Textcraft Plus, ProWrite, WordPerfect and any ASCII or IFF TEXT formatted file. To enhance your text, you can import IFF color graphics of up to 256 colors, or 4,096-color HAM images. Currently, color images are displayed on screen as halftones with 16 grey levels. An additional module supporting color correction, mechanical and four-color separation printing will follow shortly. A set of tools for creating and editing structured graphics (lines, rectangles, circles, arcs, ellipses, polygons, bezier curves) is also included. Once your page is completed you can rotate it to any angle, resize it or combine it with other pages before printing.

The Professional Page costs $395, while LaserScript is available for $44.95. Contact Gold Disk Inc., PO Box 789, Streetsville, Mississauga, Ontario, Canada L5M 2C2, 416/828-0913.

Picture Perfect

Art Parts: Volume 2 and **Seasons & Holidays** are the latest in the never-ending march of Deluxe products from Electronic Arts. Designed to work in conjunction with DeluxePaint II, DeluxePrint and DeluxeVideo, all the color images and brushes on the clip-art disks are IFF compatible. Art Parts: Volume 2 is an ecclectic mix of over 125 images, including stars and planets, military and space items, farm animals, street scenes, faces, lettering and sea life. Seasons & Holidays contains approximately 100 designs for religious and seasonal holidays as well as special occasions such as birthdays, weddings and parties. Both disks retail for $29.95. For more information, contact Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404, 415/571-7171.

Pecans for the Teacher

If you've been interested in learning Pascal but felt UCSD Pascal was too much to tackle, Pecan Software Systems just made things easier. **PDQ Pascal** is a new version of USCD Pascal designed for the fledgling programmer. Though aimed at beginners, the language doesn't skimp on functions and even includes Pecan's Power System, which lets the programmer create software that will run interchangeably on incompatible hardware without reprogramming. To get you started, the self-teaching guide describes editing, type matching, variables and constants, music, user-defined functions and procedures, among other topics. The package sells for $69.95. Direct your questions to Pecan Software Systems Inc., 1410 39th St., Brooklyn, NY 11218, 718/851-3100.

Current Events

Even electronics has joined the electronic age. **Digital Building System**, from MicroMaster Software, is an emulation and instruction system for digital electronics. You build circuits on the hi-res screen by picking parts and soldering them together. The program computes the logic state of each pin of every part and displays a part's wires in different colors depending on its state of activity. You can also change and repair circuits by soldering and desoldering joints and moving, inserting, deleting or rotating parts. Mouse driven, the system supports the logic gates AND, OR, NOT, NAND, NOR, X-OR, X-NOR, Flip-Flop, Buffer and a trigger clock. The disk-based libraries contain multiple input logic gates and the 74xx series of integrated circuits. Libraries with different integrated circuits are also available, or you can design your own parts with the accompanying Chip Editor program. The package retails for $299. For more details contact MicroMaster Software, 1289 Brodhead Road, Monaca, PA 15061, 412/775-3000.

AIRT-ist's Paint Box

PDJ Software offers help for the syntax-impaired with **AIRT**, an icon-based programming language. The icon library contains over 60 functions, ranging from basic moves and adds to complex operations like displaying IFF pictures and decompressing data. To build a program, point and click on the icons you need in the desired order. Upon selecting an icon, you must satisfy its parameters by clicking on the necessary files, forms and fields. Chosen icons are stored in cells. Groups of 75 cells make up a frame, and you can use up to 75 frames. Besides the language itself, the system includes an editor, compiler, print utility, form utility and manual. The form utility lets you include a picture from a paint program and define fields and gadgets onto it. For $64.95, plus $5 shipping and handling, AIRT is available from PDJ Software, 111 Thornwood Drive, Marlton, NJ 08053, 609/596-8991.

Was It i Before e, or...

Put away your dog-eared dictionary and join the computer age. **LexCheck**, Complete Data Automation's new spelling checker, works with Textcraft, Scribble!, Notepad and all ASCII text files. Besides the built-in 100,000-word dictionary, you can create your own for special applications. Since the dictionaries reside on disk, LexCheck only needs 100K of RAM and will run simultaneously with a word processor. Selling for $42.95, the program is available from Complete Data Automation Inc., PO Box 1052, Yreka, CA 96097, 916/842-3431.

Go Soak Your Mouse

Imagine rolling around on your desk all day without washing up. Think how your poor dirty mouse must feel! **Mouse Cleaner 360°** from Ergotron cleans the tracking rollers inside your mouse, smoothing jerky movements and increasing response time. The kit includes a velcro-covered scrubber ball, scrubber board, a chamois cloth and a bottle of cleaning solution. Apply a few drops of solution to the scrubber ball, insert it into your mouse and circle it over the scrubber board. Use the chamois to dust the mouse cavity and positioning ball. The kit retails for $16.95. Contact Ergotron, 1621 East 79th St., Minneapolis, MN 55420, 800/328-9839.

Tantalizing Terror And Floyd's Revenge

Do you like reading H.P. Lovecraft stories by candlelight, alone in an old, creaky house in the middle of nowhere during midnight thunderstorms? If so, Infocom's got a game for you—**The Lurking Horror**. You are enrolled at George Underwood Edwards Institute of Technology, which is infamous for its decrepit, crumbling tunnels, ancient basements and storage rooms full of rotting junk. On a dark and stormy night (what else?), you're drawn to the slimy underworld. One minute you're writing a term paper, the next you're clutching something that inexplicably draws you downward. [*Insert evil laugh here.*] For

$39.95 you can get scared out of your wits.

What's worse than cleaning grotch cages? The paperwork task force. In **Stationfall**, the sequel to Infocom's Planetfall, you've been promoted and sent to a neighboring space station to pick up a supply of obscure forms. Your old robot friend, Floyd, accompanies you to the station where you find only an ostrich, an Arcturian balloon creature and a robot named Plato. The captain's log describes a sudden failure of machinery; eventually even Floyd is behaving oddly. And you thought it would be another routine day in the Stellar Patrol. Stationfall sells for $34.95.

For more information contact Infocom Inc., 125 Cambridge-Park Drive, Cambridge, MA 02140, 617/492-6000.

Forth Time's the Charm

Looking for an alternative to BASIC and C? Perhaps **JForth** is the answer. Though based on Forth 83, the system also supports FIG and Forth 79 standards. Besides the compiler and language itself, the package includes a 68000 assembler and disassembler, search and sort routines, local variables and floating point utilities. Since JForth is interactive you can test any subroutine, variable, constant or data structure directly from the keyboard. An Object Oriented Development Environment, example programs and source code accompany the system. While JForth costs $99.95, you can turnkey and distribute your applications without royalties. Direct your questions to Delta Research, 201 D St., Suite 15, San Rafael, CA 94901, 415/485-6867.

Pure Genie-ous

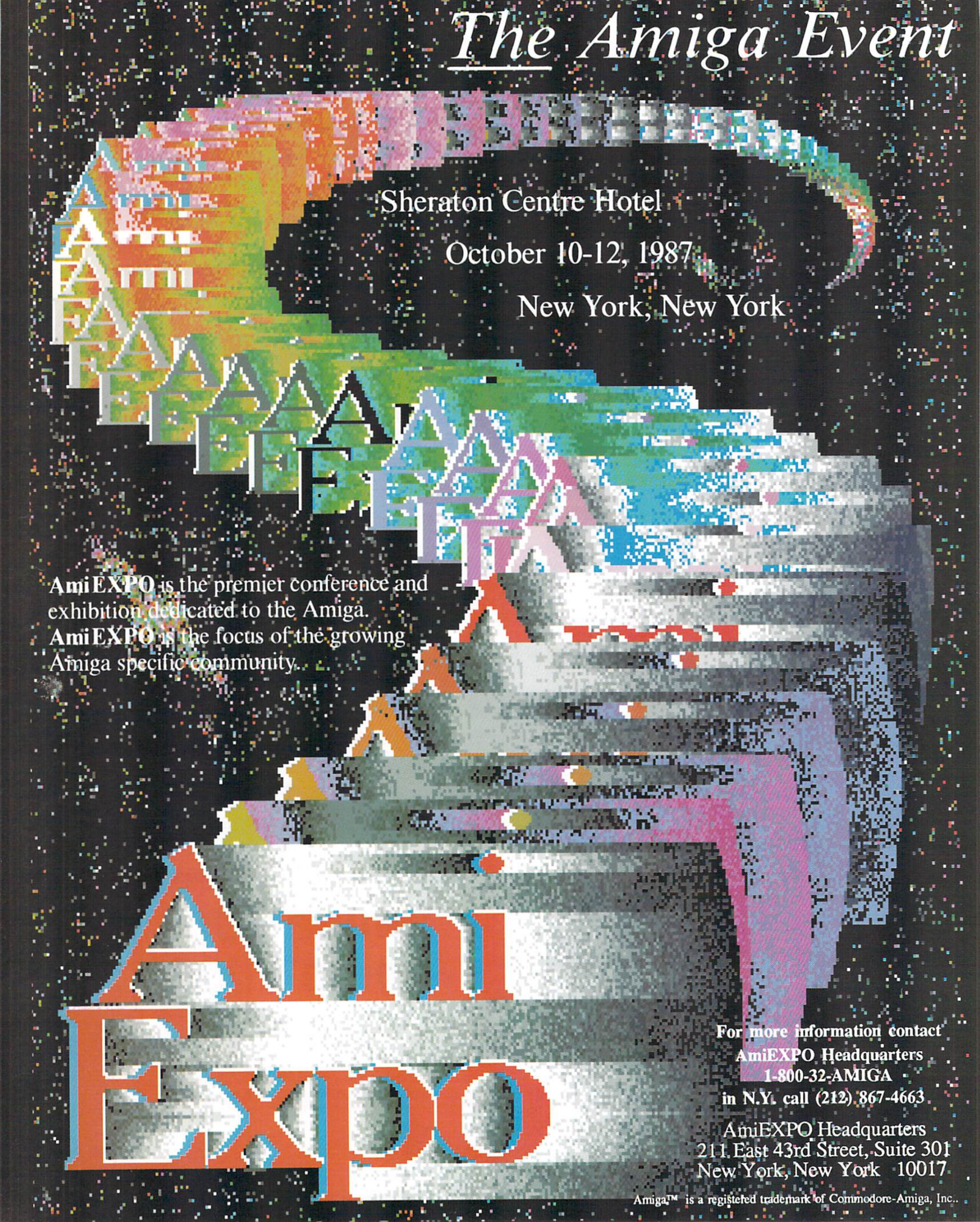
Just in off the magic carpet express is ***The New Aladdin***, a family entertainment magazine on disk, from Disk Publications. Published six times a year, the collection spans a wide range of interests—puzzles, software and movie reviews, interviews, recipes, fiction, history, debates and contests. You access the articles by mouse through a crystal ball graphics screen. Theme music is currently included and the company plans to integrate voice synthesis for interactive interviews, among other things. The cover price for a single issue is $19.95, while a six issue subscription to *The New Aladdin* is $79.95. Direct your quesitons to Disk Publications, 12200 Central Drive, Suite 310, Dallas, TX 75251, 800/345-6467.

Quick Change Artist

Dedicated to keeping you in touch with other computer worlds, Central Coast Software has introduced **DISK-2-DISK**, which transfers files between the Amiga and Commodore's 64 and 128. Converting PET ASCII into AmigaDOS standard ASCII and back again, DISK-2-DISK supports and formats 1541/4040 and 1570/1571 disks, as well as 1541 "flippies." The program allows wild cards in file names, alerts you to duplicate file names and permits file renaming. BASDIF, Validate BAM and Check Disk utilities are also included. The program retails for $49.95. Contact Central Coast Software, 268 Bowie Drive, Los Osos, CA 93402, 805/528-4906.

Somewhere Over the Rainbow

Lightning Publishing has introduced two interface products, **Rainbow Bridge** and **ATI-LINK**. The Rainbow Bridge provides an interface between any IFF file and the ACT II printer, accessing all the ACT II's zoom, aspect and multiple-copy controls. ATI-LINK converts IFF files to TARGA/TIPS format, letting you take advantage of the TARGA/TIPS slide-making capabilities. The Rainbow Bridge re- ►



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tails for $195, while ATI-LINK is $95. Contact Lightning Publishing Consultants, 333 South Glebe Road, Suite 100, Arlington, VA 22204, 703/892-9598.

Amiga Airlines

Tired of circling above the same old scenery? A companion to their Flight Simulator, subLOGIC's **Scenery Disk #7** depicts the East Coast from Washington, DC down through Key West, Florida. Detailed landscapes include rivers, coastline, roads, railroads, racetracks, transmitter towers (some even have blinking lights at night) and elevated bridges that cast shadows. You can land at over 130 airports, a dozen of which belong to the military. A ticket to ride costs $24.95, plus $2 for postage and handling. You can order directly from subLOGIC Corp., 713 Edgebrook Drive, Champaign, IL 61820, 217/359-8482.

Faster Floppies

Are your disk drives getting old and sluggish? **Facc** from ASDG is a dynamically managed buffer cache designed to speed up your floppy-disk drives. Since Facc fully supports Fast Memory, the buffer cache won't dip into chip memory. Buffers are dynamically controlled, so you can add or delete them as desired. You can monitor cache effectiveness, alter the cache size and watch disk operations with the graphic display. A system monitor is also included in the package. Facc retails for $34.95 and is available from ASDG Inc., 280 River Road, Suite 54A, Piscataway, NJ 08854, 201/540-9670.

LAN—Local Amiga Network

LAN, or Local Area Networking, has embraced the Amiga. Ameristar Technologies has released a line of network products including an **Ethernet LAN Controller**, an **ARCNET LAN Controller**, an adaption of SUN Microsystems' **Network File System (NFS)** and **ANET**, peer-to-peer networking software. The 10-megabit per second Ethernet Controller features standard Ethernet and Cheapernet, thin Ethernet, interfaces and is available in three auto-config versions, 86-pin side mount ($749), Zorro backplane ($699) and Amiga 2000 ($699). The ARCNET Controller runs at 2.5 megabits per second and handles up to 255 machines in a Token Ring network. The system automatically recognizes reconfigurations, so you can dynamically connect and disconnect computers from the network. The controller also comes in side mount ($499), Zorro backplane ($425) and A2000 ($499) configurations.

Supporting remote Login, NFS ($149) allows transparent file access with standard UDP/IP protocol over a collection of machines with different operating systems running under the Ethernet Controller. In addition, you receive an assortment of UNIX utilities. The ANET software (approximately $89 per node) runs an all-Amiga network under either an Ethernet or ARCNET controller. It allows multiple servers, file sharing and remote print. For more information on their new line, contact Ameristar Technologies Inc., PO Box 415, Hauppauge, NY 11788, 526/724-3344.

What's New With You?

Have you spent the last six months in your basement programming the second coming of the spreadsheet? Just completed a game that could boggle the imagination of George Lucas? Tell us about it, so we can tell everyone else! If you've developed a commercial product (vaporware need not apply), send a press release to: What's New?, *AmigaWorld*, 80 Elm St., Peterborough, NH 03458. ■

from p. 60

```
};
WORD BflyColors[] = { 0x0000,              /* Black */
                      0x0F00,                /* Red */
                      0x00F0               /* Green */
};
/* Images */
/* Image of left half of pig;
   even-numbered pig VSprites */
WORD PigLeft[] = { 0x0000, 0x0000,  /* Line 0, Top of
                  Left Side of Pig VSprite Image.  */
           0x0024, 0x00DB,                /* Line 1 */
           0x01FF, 0x0600,                /* Line 2 */
           0x0FFF, 0x1000,                /* Line 3 */
           0x0F7F, 0x1080,                /* Line 4 */
           0x1FBF, 0x2040,                /* Line 5 */
           0x1F3F, 0x5080,                /* Line 6 */
           0x0F7F, 0x1000,                /* Line 7 */
           0x043F, 0x0A40,                /* Line 8 */
           0x0428, 0x0856,                /* Line 9 */
           0x0400, 0x0A00    /* Line 10 - Pig Feet */
};
/* Image of right half of pig;
   odd-numbered pig VSprites */
WORD PigRight[] = { 0x02C0, 0x0000, /* Line 0, Top
                                       Right of Pig */
            0xC300, 0x2000,               /* Line 1 */
            0xFFC0, 0x0000,               /* Line 2 */
            0xFBE0, 0x04C0,               /* Line 3 */
            0xF7FC, 0x0800,               /* Line 4 */
            0xBFFC, 0x400C,               /* Line 5 */
            0x7B80, 0x8440,               /* Line 6 */
            0x6000, 0x9800,               /* Line 7 */
            0x4000, 0x0000,               /* Line 8 */
            0x4000, 0x0000,               /* Line 9 */
            0x4000, 0xA000   /* Line 10 - Pig Feet */
};
/* Butterfly Image */
WORD Butterfly[] = { 0x0420, 0x0000,  /* Line 0 -
                                      Butterfly Top */
            0x0240, 0xC003,               /* Line 1 */
            0x518A, 0xF81F,               /* Line 2 */
            0x4BD2, 0x7E7E,               /* Line 3 */
            0x3DBC, 0x366C,               /* Line 4 */
            0x0BD0, 0x1668,               /* Line 5 */
            0x15A8, 0x3C3C,               /* Line 6 */
            0x2994, 0x781E,               /* Line 7 */
            0x0180, 0x8001,          /* Line 8; End */
};
/* The VSprites themselves */
/* 2 Pigs, left and right parts each, and 1 ButterFly
 The Balloon Bob keeps its VSprite separately.     */
struct VSprite *MyVSprites[5] = {
                    NULL, NULL, NULL, NULL, NULL};
/* Bob and related info. */
/* Balloon Image--color bit mask for each of three
planes, one at a time. The colors are the screen
colors; so a 1 in plane 0, a 1 in plane 1, and a 0 in
plane 0 is RED--color index 6  (110 binary).       */
WORD Balloon[] = {                     /* Bit Plane 0 */
 0x001D, 0xA000,  0x0079, 0x9100, /* Lines 0 and 1 */
 0x00F1, 0x8980,  0x03D3, 0x84C0,       /* 2 and 3 */
 0x03C7, 0x82C0,  0x07A7, 0x81E0,       /* 4 and 5 */
 0x072F, 0x81E0,  0x072F, 0x81E0,       /* 6 and 7 */
 0x072F, 0x81E0,  0x797,  0x82E0,       /* 8 and 9 */
 0x0397, 0x82C0,  0x01C3, 0x8480,     /* 10 and 11 */
 0x0075, 0x8400,  0x007D, 0x8400,     /* 12 and 13 */
 0x002E, 0x8800,  0x0016, 0x9000,     /* 14 and 15 */
 0x0012, 0x9000,  0x000A, 0x6000,     /* 16 and 17 */
 0x000A, 0x6000,  0x0006, 0xA000,     /* 18 and 19 */
 0x0007, 0xE000,  0x0007, 0xE000,     /* 20 and 21 */
 0x0007, 0xE000,  0x0007, 0xE000,     /* 22 and 23 */
/* Bit Plane 1 */
 0x001B, 0x8C00,  0x0077, 0x8F00, /* Lines 0 and 1 */
 0x00EF, 0x8780,  0x03CF, 0x8BC0,       /* 2 and 3 */
 0x03DF, 0x8DC0,  0x07DF, 0x8EE0,       /* 4 and 5 */ ►
```

```
 0x07DF, 0x86E0,  0x07DF, 0x86E0,        /* 6 and 7 */
 0x07DF, 0x86E0,  0x07EF, 0x85E0,        /* 8 and 9 */
 0x03EF, 0x85C0,  0x01F7, 0x8B80,       /* 10 and 11 */
 0x007B, 0x8A00,  0x003B, 0x8800,       /* 12 and 13 */
 0x000B, 0x9000,  0x0003, 0xA000,       /* 14 and 15 */
 0x0001, 0x8000,  0x0000, 0x0000,       /* 16 and 17 */
 0x0000, 0x0000,  0x0000, 0x0000,       /* 18 and 19 */
 0x0000, 0x0000,  0x0000, 0x0000,       /* 20 and 21 */
 0x0000, 0x0000,  0x0000, 0x0000,       /* 22 and 23 */
/* Bit Plane 2 */
 0x0003, 0xD000,  0x0007, 0xE000, /* Lines 0 and 1 */
 0x000F, 0xF000,  0x002F, 0xF0C0,        /* 2 and 3 */
 0x001F, 0xF000,  0x00DF, 0xF000,        /* 4 and 5 */
 0x00DF, 0xF800,  0x00DF, 0xF800,        /* 6 and 7 */
 0x00DF, 0xF800,  0x006F, 0xF800,        /* 8 and 9 */
 0x006F, 0xF800,  0x0037, 0xF000,       /* 10 and 11 */
 0x000B, 0xF000,  0x0003, 0xF000,       /* 12 and 13 */
 0x0001, 0xE000,  0x0001, 0xC000,       /* 14 and 15 */
 0x0001, 0xC000,  0x0000, 0x0000,       /* 16 and 17 */
 0x0000, 0x0000,  0x0000, 0x0000,       /* 18 and 19 */
 0x0007, 0xE000,  0x0007, 0xE000,       /* 20 and 21 */
 0x0007, 0xE000,  0x0007, 0xE000        /* 22 and 23 */
};
/* The Bob itself */
struct Bob *MyBob;                  /* Balloon's Bob */
/* End PIGS1.C--Stayed tuned for part 2             */
```

```
/* pigs.h--include file for tutorial program. */
/* Amiga Include Files */
#include <exec/types.h>
#include <exec/exec.h>
#include <devices/console.h>
#include <devices/timer.h>
#include <graphics/gfx.h>
#include <graphics/clip.h>
#include <graphics/view.h>
#include <graphics/rastport.h>
#include <graphics/layers.h>
#include <graphics/regions.h>
#include <graphics/copper.h>
#include <graphics/display.h>
#include <graphics/collide.h>
#include <intuition/intuition.h>
/*
The VSprite struct declaration in gels.h has a user-
definable structure as its last element.  If the
word VUserStuff is #defined before gels.h is in-
cluded, the struct it is defined to be will be
used as that user-defined final element.  The
struct my_Vinfo, below, serves that purpose; and
allows each VSprite to carry information I need
in my collision handler and object movement code. */
struct my_Vinfo {
   short myflags;
/* Direction for Butterfly, in or out of jump mode
for pig. The following 6 elements allow me to move
the VSprite at integral velocities in fractions or
multiples of screen refresh rate without using
floating pt math. */
   short whenx, wheny;     /* Increment VSprite x,y
                  when this  decrements to 0).  */
   short xstart,ystart;  /* whenx, wheny reset values
after hits 0 (3 = one move each 3 frames) */
    short xincr, yincr;     /* Increment for x and y
each time whenx,wheny hit 0. For Butterfly, yincr is
used as index into bfly_ys array (below), to give
butterfly variable y movement. */
   short my_id;        /* Used to distinguish VSprites
when collision handler gets called with one. */
};
/*The following define lets me to overlay the default
definition of VUserStuff in gels.h with my own.    */
#define VUserStuff struct my_Vinfo
#include <graphics/gels.h>
/*   General Defines and Macros   */
```

```
/* Screen Sizes */
#define WIDTH  320     /* Width of screen in pixels */
#define HEIGHT 200   /* Height of screen in pixels */
#define DEPTH  3  /* Bitplane depth: 3 == 8 colors */
/* Useful VSprite Constants */
#define VSPRITE_DEPTH    2
               /* No. of Bitplanes used in VSprite */
#define VSPRITE_WIDTH    1
                 /* No. of words wide a VSprite is */
/*  Background Locations */
#define GRASSLEVEL  190
                /* Y offset of top of "grass" area */
#define WALL_LEFT   180
                 /* Start X of wall pigs jump over */
#define WALL_RIGHT  210           /* End X of wall */
#define WALL_BOT     GRASSLEVEL   /* Bottom of wall */
#define WALL_TOP     (WALL_BOT - 20) /* Top of wall */
/* Close-up-shop Bits */
/* Given that we might run out of memory at any point
during setup, the setup routine keeps track of what
has been opened and initialized via the following
bits and the long int close_mask; the close_up_shop
routine will free/close only those things whose bits
are on. */

#define CL_GFXLIB  0x0001 /* Free graphics library */
#define CL_INTLIB  0x0002   /* Free Intuition lib. */
#define CL_SCREEN  0x0004          /* Close screen */
#define CL_BITMAP  0x0008          /* Free BitMaps */
#define CL_WINDOW  0x0010          /* Close window */
#define CL_GELS    0x0020   /* Free GelsInfo stuff */
#define CL_VSPRITES 0x0040       /* Free VSprites */
#define CL_VSPLIST  0x0080
                  /* Remove VSprites from Gel list */
#define CL_BOBS     0x0100           /* Free Bobs */
#define CL_BOBLIST  0x0200
                      /* Remove Bobs from Gel list */
extern unsigned long close_mask;  /* Mask used by
         close_up_shop to decide what to close.   */
extern struct color4 {
        WORD red;          /* Red component of color */
        WORD green;      /* Green component of color */
        WORD blue;        /* Blue component of color */
} scrcolor[8];               /* Screen main colors */
/* Indices of colors to be put in scrcolor */
#define BLUE              0          /* Blue's index */
#define BLACK             1
#define WHITE             2
#define YELLOW            3
#define GREEN             4
#define GREY              5
#define RED               6
#define ORANGE            7
/* VSprites and Related Info */
/* Pig Constants */
#define NPIGS              2     /* pigs in animation */
#define SPRITES_PER_PIG    2      /* VSprites per pig */
#define PIG_WIDTH         32      /* 2 VSprite widths */
#define PIG_MIDDLE        16
#define PIG_HEIGHT        11     /* Pig height in pixels */
#define PIG_WXRUN          1      /* Incr x every frame. */
#define PIG_WYRUN          1           /* Ditto for y. */
#define PIG_XRUN           1 /* Dist. Pig runs each incr */
#define PIG_YRUN          -1 /* Pig has a hopping sort of
          run, 1 pixel one frame, down 1 the next. */
/* Wall is just under 2 pig-heights. Scale jump so
pig starts one pig-width away and rises above wall.
Jump is actually a triangle; if I were more realistic
I would pre-calculate & store a parabola; but a tri-
angle is cheap with integer math and close enough. */
#define JUMP_BEGIN  (WALL_LEFT - (PIG_WIDTH * 1))
#define JUMP_MID     WALL_RIGHT-5  /* Start of Fall */
/* Defines for VUserStuff part of VSprite */
#define PIG_WXJUMP  1 /* Incr x once/frame on jump */
#define PIG_WYJUMP  1    /* Incr y every frame on jump
   pig will rise at half the rate it goes forward. */
#define PIG_XJUMP   1     /* Distance Pig goes forward ►
```

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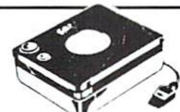
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```
                                on Jump per frame. */
#define PIG_YUP    -1              /* Rate of Rise. */
#define PIG_YDOWN   1              /* Rate of Fall. */
#define PIGF_RUN    0         /* If Pig's
 VSprite.VUserExt.myflags is this, pig is running. */
#define PIGF_RISE   1     /* If Pig's myflags is this,
                               pig is rising in jump. */
#define PIGF_FALL   2     /* If Pig's myflags is this,
   pig is is falling from mid jump height. Otherwise,
                                     pig is running. */
/* Butterfly Constants */
#define BFLY_WIDTH   16          /* One VSprite wide */
#define BFLY_HEIGHT   9  /* Butterfly pixel height */
#define BFLY_XFIRST  50          /* Initial Position */
#define BFLY_YFIRST 100
/* Defines for VUserStuff part of Butterfly */
#define BFLY_XWHEN   1          /* X Move every frame */
#define BFLY_YWHEN   2    /* Y move every other frame;
                              see bfly_ys below. */
#define BFLY_XINC    1 /* Move one pixel each when */
#define BFLY_CYCLE  16
/* The VSprites themselves */
/* 2 Pigs, left and right parts each; 1 ButterFly.
    The Balloon Bob keeps its VSprite separately.  */
struct VSprite *MyVSprites[5];
#define PIG1L_ID  0       /* VSprite index, left side,
                                                Pig1 */
#define PIG1R_ID  1              /* Pig 1, right side */
#define PIG2L_ID  2               /* Pig 2, left side */
#define PIG2R_ID  3              /* Pig 2, right side */
#define BFLY_ID   4      /* Butterfly VSprite index */
/* Bob and related info. */
/* Balloon Constants */

#define BALL_WIDTH   32          /* Height of Balloon */
#define BALL_HEIGHT  24
#define BALL_DEPTH    3              /* Up to 8 colors */
#define BALL_Y       40 /* Y offset of Balloon top */
#define BALL_PPICK   0x03      /* Balloon PlanePick */
#define BALL_PONOFF  0x03     /* Balloon PlaneOnOff */
#define BALL_BFLAGS  0    /* No Bob flags for Balloon
                                                  Bob */
#define BALL_VFLAGS  SAVEBACK | OVERLAY    /* VSprite
  flags for Bob - save background, use ImageShadow to
                              determine what to overlay. */
#define BALL_ID      5    /* Balloon Bob's VSprite id,
                             for collision detection. */
/* Balloon's VSprites VUserStuff defines */
#define BALL_XWHEN 1              /* Move every frame */
#define BALL_XINC  2 /* Moves this much each frame */
#define BALL_MAXSPEED   15  /* Maximum balloon speed,
                                        pixels/frame. */
#define BALLF_SPEED   0  /* Balloon is speeding up */
#define BALLF_SLOW    1 /* Balloon is slowing down */
/* Function declarations, so the C compiler doesn't
think they return ints.                              */
/* Amiga Functions */
extern long ReplyMsg();
extern long Wait();
extern long Request();
extern long CloseLibrary();
extern long CloseWindow();
extern struct Screen *OpenScreen();
extern struct Window *OpenWindow();
/* My own functions which need forward declarations */
struct GelsInfo *getGelsInfo();
/* Init GelsInfo struct and Gel system. Returns ptr to
   a GelsInfo struct if setup went ok, NULL if not. */
struct VSprite *getVSprite();
/* My make-a-VSprite routine.  Returns ptr to VSprite
   or NULL if no room to allocate one. */
struct Bob *getBob();  /* Make-a-Bob routine. Returns
     ptr to Bob or NULL if no room to allocate one. */
void bndcol_hdlr();   /* Handles boundary collisions.
                             Needed by getGelsInfo.  */
/*----- End PIGS.H ---------------------------------*/
```
■

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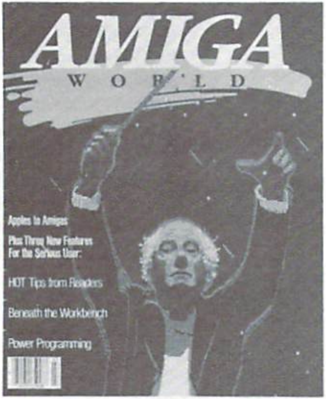
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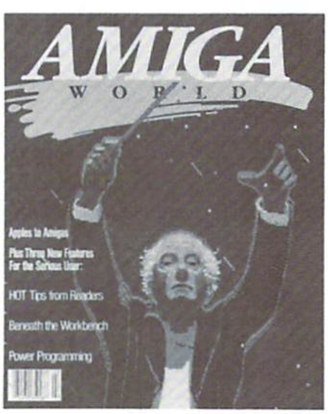
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3	8	13	18	23	203	208	213	218	223	403	408	413	418	423
4	9	14	19	24	204	209	214	219	224	404	409	414	419	424
5	10	15	20	25	205	210	215	220	225	405	410	415	420	425
26	31	36	41	46	226	231	236	241	246	426	431	436	441	446
27	32	37	42	47	227	232	237	242	247	427	432	437	442	447
28	33	38	43	48	228	233	238	243	248	428	433	438	443	448
29	34	39	44	49	229	234	239	244	249	429	434	439	444	449
30	35	40	45	50	230	235	240	245	250	430	435	440	445	450
51	56	61	66	71	251	256	261	266	271	451	456	461	466	471
52	57	62	67	72	252	257	262	267	272	452	457	462	467	472
53	58	63	68	73	253	258	263	268	273	453	458	463	468	473
54	59	64	69	74	254	259	264	269	274	454	459	464	469	474
55	60	65	70	75	255	260	265	270	275	455	460	465	470	475
76	81	86	91	96	276	281	286	291	296	476	481	486	491	496
77	82	87	92	97	277	282	287	292	297	477	482	487	492	497
78	83	88	93	98	278	283	288	293	298	478	483	488	493	498
79	84	89	94	99	279	284	289	294	299	479	484	489	494	499
80	85	90	95	100	280	285	290	295	300	480	485	490	495	500
101	106	111	116	121	301	306	311	316	321	501	506	511	516	521
102	107	112	117	122	302	307	312	317	322	502	507	512	517	522
103	108	113	118	123	303	308	313	318	323	503	508	513	518	523
104	109	114	119	124	304	309	314	319	324	504	509	514	519	524
105	110	115	120	125	305	310	315	320	325	505	510	515	520	525
126	131	136	141	146	326	331	336	341	346	526	531	536	541	546
127	132	137	142	147	327	332	337	342	347	527	532	537	542	547
128	133	138	143	148	328	333	338	343	348	528	533	538	543	548
129	134	139	144	149	329	334	339	344	349	529	534	539	544	549
130	135	140	145	150	330	335	340	345	350	530	535	540	545	550
151	156	161	166	171	351	356	361	366	371	551	556	561	566	571
152	157	162	167	172	352	357	362	367	372	552	557	562	567	572
153	158	163	168	173	353	358	363	368	373	553	558	563	568	573
154	159	164	169	174	354	359	364	369	374	554	559	564	569	574
155	160	165	170	175	355	360	365	370	375	555	560	565	570	575
176	181	186	191	196	376	381	386	391	396	576	581	586	591	596
177	182	187	192	197	377	382	387	392	397	577	582	587	592	597
178	183	188	193	198	378	383	388	393	398	578	583	588	593	598
179	184	189	194	199	379	384	389	394	399	579	584	589	594	599
180	185	190	195	200	380	385	390	395	400	580	585	590	595	600

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